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RADC-TR-77-431, Volume II (of three)
Final Technical Report
January 1978

ATEC DIGITAL ADAPTATION STUDY, Development and Field Evaluation - Digital Automated Technical Control

Mr. T.J. Campbell
Dr. W.F. Acker
Mr. C.L. Christner
Mr. D.T. Doyle
Mr. W.M. Goldstein
Mr. R.L. Tufaner

Honeywell Inc.

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ROME AIR DEVELOPMENT CENTER
Air Force Systems Command
Griffiss Air Force Base, New York 13441

Because of the size of this report, it has been divided into three volumes. Volume I contains Sections 1 through 5. Volume II contains Section 6. Volume III contains Section 7 and Appendices A and B.

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RADC-TR-77-431, Volume II (of three) has been reviewed and is approved for publication.

APPROVED: Arnold E Argenzia

ARNOLD E. ARGENZIA
Project Engineer

APPROVED: Fred I Diamond

FRED I. DIAMOND
Technical Director
Communications and Control Division

FOR THE COMMANDER: John P. Huss

JOHN P. HUSS
Acting Chief, Plans Office

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Performance Assessment, Fault Isolation, and Trend Analysis (PA/FI/TA) in Digital Transmission Systems
ATEC (Automatic Technical Control) Applicability for PA/FI/TA in the FKV Digital Transmission System
Sudden Service Failure Sensing System (SSFSS)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Subsequent to the completion of the feasibility phase of the ATEC Digital Adaptation Study, existing ATEC hardware and software was adapted or developed to provide Performance Assessment (PA), Fault Isolation (FI) and Trend Analysis for the FKV type digital transmission systems. The resulting DATEC system was then field tested using the facilities of the digital transmission test bed located at Ft. Huachuca, Arizona. The purpose of the field evaluation was to confirm the basic concepts, exercise and test the developed hardware

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and software, and verify DATEC's capabilities to accomplish PA/FI/TA in the operational environment of an operating digital transmission system. These DATEC capabilities are directed towards the centralized nodal monitoring of numerous digital transmissions links.

The DATEC field evaluation confirmed both the practicality and advantages inherent in automated digital system monitoring, insofar as enabling the centrally located controller to performance assess, trend analyze and fault isolate the digital transmission system for numerous failure occurrences and patterns and system parameter degradation. DATEC enables technicians to monitor in-service system parameters thereby enhancing system performance and allowing more efficient utilization of maintenance resources.

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Because of the size of this report, it has been divided into 3 volumes:

Volume I contains Sections 1 through 5.

Volume II contains Section 6.

Volume III contains Sections 7 and Appendices A and B.

Section 6

FIELD TEST RESULTS RELATIVE TO STATEMENT OF WORK REQUIREMENTS

GENERAL

This section is essentially reproduced from Section III of the test report for the Field Test and Evaluation phase of the ATEC Digital Adaptation program. The data taken from the test scenarios has been included with this section to provide a convenient reference.

SUMMARY

The primary objective of the field tests, as stated in the Statement of Work (S.O.W.) for the ATEC Digital Adaptation Study, was "to give the DATEC system a detailed shakedown via operational testing so that its feasibility and its potential use in an operational digital system, as typified by the FKV system, could be determined". In a more explicit manner, the S.O.W. breaks down the primary objective into 23 separate evaluation items. The purpose of Paragraph 6.1 of this section of the test report is to list each of these items (tasks) individually along with substantiating data or other material relating to the topic, not only to more clearly demonstrate compliance with the S.O.W., but also to present in the most straightforward manner the advantages (and disadvantages) of the DATEC system with respect to program requirements.

Preceding the list of 23 evaluation items and providing a quick reference summary of S.O.W. compliance, is a matrix relating each evaluation item to the validation test or test scenario in which it was addressed. This matrix is presented as Table 6-1.

Also included in this section are comments specifically addressing a number of software related tasks delineated in Paragraph 4.1.12.10.4 of the S.O.W. These comments may be found in Paragraph 6.2.

Finally, Paragraph 6.3 of this section is concerned with several additional items suggested by RADC for consideration.

BACKGROUND

The operational Field tests which were conducted were divided into two distinct categories. The first phase dealt with a quantitative check of the DATEC system; that is, in the operational communication system environment, known perturbations were

introduced to elicit measurable and expected results. These tests validated the basic requirements imposed on DATEC as a monitoring system and verified DATEC/communication system interface compatibility. The second phase of testing dealt with the more subjective aspects of evaluating the DATEC system relative to its utility and effectiveness as a monitoring system. In order to more accurately assess these aspects, among which was the man-machine relationship, the tests were conducted in a series of scenarios with site operational personnel (Tech Controllers) operating as the Nodal Controllers. Again, perturbations to the communication system were introduced, with the emphasis in this case on realism, and for the purpose of exploiting the capabilities of the DATEC system relative to Performance Assessment, Fault Isolation and Trend Analysis.

References are made in this section to field test System Simulation Scenario test data to illustrate certain aspects of DATEC evaluation. This data is included throughout this section as explained below. These scenarios involved a simulated anomaly or multiple anomalies to the communciation system. Tech controllers from the service, working in pairs, were at the nodal control position at Ft. Huachuca. The tech controllers had received several hours of briefing on DATEC equipment, its relationship to the communication system, use of the different displays and the method of calling up displays via the keyboard.

One or more perturbations were introduced to the communication system by Honeywell personnel during each scenario. A predetermined procedure was used. The time of each perturbation introduction was noted on the procedure sheets. The tech controllers - one of which was in command the other in charge of making notations and keeping records - logged their entries on a DATEC System Evaluation Worksheet. To help document their activities, they made printouts of various displays which they considered pertinent during conduction of the scenarios. The excerpts, then, consist of matter taken from these procedures, worksheets, and printouts which are considered appropos for illustration purposes.

6.1 VALIDATION/EVALUATION CRITERIA LIST

This section presents detailed discussions of 23 specific items delineated in the S.O.W. for consideration during the field test phase of the ATEC Digital Adaptation Study. Although a number of the items are closely related, each is treated separately in an effort to demonstrate complete compliance with the S.O.W.

As a summary guide, the matrix shown in Table 6-1, following, gives a cross reference between the S.O.W. requirements paragraph number (4.1.12.7.1 through 4.1.12.7.23); the paragraphs of this section addressing the particular S.O.W. requirement; the Validation Test/Simulation Scenario addressing the S.O.W. requirement; and the field test report paragraph number in Section II of that report where the Validation Test/Simulation Scenario data may be found.

TABLE 6-1. DATEC FIELD TEST AND EVALUATION CROSS REFERENCE MATRIX

Para Ref: Statement of Work	Para Ref: Test Report	Evaluation Tasks Specified by the Statement of Work	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T	U	V	W	P'	U'	V'	AA	BB	CC	DD	EE	FF	S
			Validation Tests									Simulation Scenarios																			
		Field Test Plan and Procedure Appendix Reference	SSFSS, Alarms, and Two-State Parameters	RSL Margin and Availability	Maintenance Voltages	T1WB1 Frame Error Rates and Reframe	T1-4000 Frame Error Rate, Availability and Control Reframes	Baseband Eye Monitor Parameters	Correlative Parameters	VF Channel Measurements	Operation with Degraded Conditions	Link RF Fading (Propagation) 1. Single Receiver Fade 2. Simultaneous Deep Fade	Receiver Noise Figure Degradation - A vs B	Transmitter Output Power Problem	Antenna Malalignment 1. Reciprocal Path Problem 2. Transmit Antenna Only at Sibyl	T1-4000 Multiplex Maintenance Error - SBL	Low Level MUX Failure - Power Supply	RFI and Abnormal Interference 1. RFI at SHF - RF Level 2. RFI at Baseband Level	Multiple Link Equipment Failures	T1-4000 Framing Error Equipment Failure	T1WB1 Framing Error Equipment Failure	User VF Channel Degradation 1. Without Channel Simulator 2. With Channel Simulator	Low Level MUX Failure, Power Supply, HUA	T1-4000 Framing Error Equipment Failure, HUA	T1WB1 Framing Error Equipment Failure, HUA	High Level MUX Failure, Power Supply, HUA	High Level MUX Failure, Power Supply, SBL	Operation Under Degraded Conditions	Higher MUX Failure, T1WB1 Channel Card	Unrelated Multiple Failures, 1	Unrelated Multiple Failures, 2	Special RSL Long Term Test
		Field Test Report Paragraph Containing Detailed Test Data	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.3.6	2.3.7	2.3.8	2.3.9	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.6	2.4.9	2.4.10	2.4.12	2.4.13	2.4.14	2.4.15	2.4.16	2.4.17	2.4.18
4.1.12.7.1	6.1.1	The Parameters/Alarms Monitored for CPMAS.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.12.7.2	6.1.2	*The PATE software adaptation requirements* specified in Paragraphs 1.3 through 1.3.1.4 of Annex 2 of the S.O.W.	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.12.7.3	6.1.3	The hardware adaptation requirements specified in Paragraphs 1.2 through 1.2.2.9 of Annex 2 of the S.O.W.				X	X	X	X			X	X					X		X	X			X	X					X	X	
4.1.12.7.4	6.1.4	The DATEC capability to accomplish sudden service failure sensing, omnistratametric monitoring, *and nodal control monitoring.*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.12.7.5	6.1.5	The DATEC performance in both the active scan and the special request modes of operation.		X						X		X	X		X		X	X		X		X			X		X			X	X	
4.1.12.7.6	6.1.6	The DATEC capab*ility to accomplish* the proposed CPMAS functions, to provide this information in a timely manner, to achieve and maintain the performance objectives of *the FKV type system.*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.12.7.7	6.1.7	The DATEC capability to facilitate CPMAS procedures.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
4.1.12.7.8	6.1.8	The adequacy, effectiveness, and feasibility of the DATEC system concept and its components in monitoring, testing, analyzing, presenting, and reporting CPMAS information.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
4.1.12.7.9	6.1.9	The accuracy, *reliability, utility, and* completeness of the data queries, analyses, summaries, and output displays.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.12.7.10	6.1.10	The accuracy, reliability, and utility of the DATEC measurements relative to circuits of different qualities, i.e., determine the operational scope of the DATEC measurements.								X												X										
4.1.12.7.11	6.1.11	The accuracy, reliability, and utility of the performance assessment/*trend analysis capa*bilities to resolve degradations.		X		X							X	X	X			X		X	X	X		X	X					X	X	X
4.1.12.7.12	6.1.12	*The fault location times as affected by DATEC.*											X																			
4.1.12.7.13	6.1.13	The output data relative to its utility in optimizing preventative maintenance schedules and the maintenance effort of the FKV type equipment.		X	X			X		X			X	X	X		X			X	X	X	X	X	X	X	X		X	X	X	
4.1.12.7.14	6.1.14	*The ability of DATEC to provide sufficient in*formation to determine the proper thresholds for alarm/parameter indicators.		X	X	X	X	X		X		X								X												X
4.1.12.7.15	6.1.15	The recommended sample rates for the most effective use of DATEC.											X																	X	X	
4.1.12.7.16	6.1.16	The communications system operations during degraded/normal operating conditions of the DATEC system.									X																					
4.1.12.7.17	6.1.17	The DATEC system operations during degraded conditions of both the communications system *and the DATEC system.*									X																	X				
4.1.12.7.18	6.1.18	The capability of DATEC to recover from a power loss.	Test scenario deferred - see Software Log Book No. 466, page 36, Addendum 2 to Field Test and Evaluation Rpt																													
4.1.12.7.19	6.1.19	The ability of nodal site to obtain information on parameters/alarms monitored at the remote site.	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X						X	X		X	X	
4.1.12.7.20	6.1.20	The effects of DATEC caused by degradation or *total outage of the transmission link* connecting the PATE with the remote site DATEC equipments.	X						X		X								X												X	
4.1.12.7.21	6.1.21	The man-machine interface and if the interface can be easily accomplished in the operational environment, and if it is presented in a format that is useful *to operational personnel.*										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4.1.12.7.22	6.1.22	The ability to use DATEC without the support *of on-site computer software personnel.*										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4.1.12.7.23	6.1.23	The ease with which data base changes most frequently required during operation can be accomplished.	Preparation for Validation Tests (AN/FRC-162 and DRBA)																													

6.1.1 The Parameters/Alarms Monitored for CPMAS

Following is a list of the parameters and alarms monitored by DATEC along with an associated list of CRT display pages where these parameters/alarms are displayed.

TABLE 6-2. PARAMETERS/ALARMS MONITORED FOR CPMAS

Parameter/Alarm	CRT Display Page
Radio:	
RSL Margin	Link Status, Page 1; Link Performance Assessment (P.A.), Page 1
RSL Availability	Link P.A., Page 1
Eye Margin	Link Status, Page 1; Link P.A., Page 1
Eye Availability	Link P.A., Page 1
Eye Amplitude (dBm)	Link Status, Page 1
Eye Hits	Link Status, Page 1; Link P.A., Page 1
Eye Voltage (Dispersion Vdc)	Link P.A., Page 2
Derived BER	Link Status, Page 1
Receiver Squelch	Link Status, Page 1; Link P.A., Page 2
Maintenance Voltages (+24 Vdc, -20 Vdc; RX A only)	Maintenance Voltages
Radio RX (Major Alarm)	System Overview*
TX Problem	System Overview; Link Status, Page 1*
RX Problem	System Overview; Link Status, Page 1*
TX In-Service	Link Status, Page 1*

* Also displayed on Alarm Scanner and Alarm Display.

TABLE 6-2. PARAMETERS/ALARMS MONITORED FOR CPMAS (Continued)

Parameter/Alarm	CRT Display Page
Radio: (Continued)	
RX In-Service	Link Status, Page 1*
Maintenance	System Overview; Link Status, Page 1*
T1-4000:	
Frame Error Rate (FER)	Link Status, Page 1; Link P.A., Page 3
FER Availability	Link P.A., Page 3
Control Reframe	Link Status, Page 1; Link P.A., Page 3
Maintenance Voltages (+5 Vdc, -6 Vdc; A MUX only)	Maintenance Voltages
Switch Major (Alarm)	System Overview; Link Status, Page 1*
Switch Minor (Alarm)	System Overview; Link Status, Page 1*
Major (Alarm)	System Overview; Link Status, Page 1*
TX In-Service	Link Status, Page 1*
RX In-Service	Link Status, Page 1*
Maintenance	System Overview; Link Status, Page 1*
CY-104:	
Channel (VF Level and Signal/Noise Ratio)	Link Status, Page 2
Service (Alarm)	Link Status, Page 2*
Remote (Alarm)	Link Status, Page 2*
Maintenance	System Overview; Link Status, Page 2*

* Also displayed on Alarm Scanner and Alarm Display.

TABLE 6-2. PARAMETERS/ALARMS MONITORED FOR CPMAS (Continued)

Parameter/Alarm	CRT Display Page
T1WB1:	
FER	Link Status, Page 2; Line P.A., Page 4
Reframe	Link Status, Page 2; Link P.A., Page 4
Maintenance Voltages (+15 Vdc, -9 Vdc)	Maintenance Voltages
Office (Alarm)	System Overview; Link Status, Page 2*
Site:	
Flood (Simulated Alarm)	System Overview; Link Status, Page 2*
Correlated Parameters:	
BER Correlation	Link Status, Page 1
Control Reframe/Squelch	Link P.A., Page 3
Control Reframe/Hit	Link P.A., Page 3
Link Availability	Link P.A., Page 2

*Also displayed on Alarm Scanner and Alarm Display.

Verification of the above listed parameters and alarms with regard to their presence and/or accuracy was accomplished in the validation phase of field tests. Refer to the individual validation test results in Section II of the Field Test and Evaluation Report.

With respect to the utility and effectiveness of these particular alarms and parameters that were selected for use in monitoring the Ft. Huachuca-to-Site Sibyl digital transmission test link, it is not practical to discuss them all, but several samples of alarms and of different parameter types will be taken from test scenarios.

Following the examples above are several remarks regarding the completeness of the alarms/parameters monitored for CPMAS and some considerations for improvement.

Any scenario involving loss of service created by a major alarm condition in any of the communication system elements was immediately recognized by the tech controllers. In the first examples taken from Appendix P conducted on 6 June 1977, illustrating one of the major equipment alarm conditions, a fuse was removed from T1WB1 at Ft. Huachuca (HUA) at 0857 hours. The tech controller's

PROCEDURE	DATE	TIME
P1. At ~~SBL~~ HUA, remove the CONV fuse on the Power and Alarm panel of the T1WB1. Record the time.	6-6-77	0857
P2. At completion of the test, replace fuse in T1WB1 equipment.	6-6-77	0920

CONDUCTED BY C. L. Christner 6-6-77

OBSERVED BY ______________

6 June 77 Pg #'1

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Sta rt new da y, with all systems on "A", and all fivers.. Systemdata attached..///RR	1-4/6 June 77	6/6	0850
CRT display shows RED flag on T1WB1 both here and a t SBL..Chking further ATT...///RR	5/6 June 77		0857
Problem isolated to bad T1WB1 here a t HUA, caused by +15 and +12 Vdc pwr supply...Maintenance a dvsd to chker the T1WB1 (here at HUA)...////RR	6/6 June 77		0903
Problem Resolved.....Isolated to blown fuse in the T1WB1 at HUA.. Maintenance replaced same and all fivers A TT...../////RR	6/6 June 77		0910

TECH CONTROLLER DBS.

OBSERVED BY (R)

6 JUNE #1

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MAC-1-Ø7-12                               SYSTEM OVERVIEW                        TIME  157/Ø34Ø:2
                 HUA         SBL
RADIO A           .           .
      B           .           .
MUX SW            .           .
     A            .           .
     B            .           .
CY1Ø4             .           .
                  .           .
                  .           .
                  .           .
                  .           .
                  .           .
                  .           .
TIWBI             .           .
                  .           .
                  .           .
             ......................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .
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```
IQ-ØØ5                               LINK STATUS                      TIME  157/Ø341:28
                               ......T1-4ØØØ......                    ......RADIO......
                                  HUA         SBL                       HUA        SBL
  ALARM       SW MAJOR                  .                 TX PROB              .
              SW MINOR                  .                 RX PROB              .
              MAJOR                     .                                      .
  STATUS      TX IN SVC           A     .     A           TX IN SVC      A     .     A
              RX IN SVC           A     .     A           RX IN SVC      A     .     A
              MAINT                     .                 MAINT                .
  PARAMETER   FER             <1.ØE-7   .<1.ØE-7          RX SQUELCH           .
              CRFRM                     .                 RSL MARGIN   3Ø.778  . 39.25Ø
                                                          EYE MARGIN   15.Ø14  . 13.369
              BER COR         NO DATA   .NO DATA          EYE AMPL    -8.9677  .-8.9677
                                                          EYE HITS        Ø.Ø  . .Ø1169
                                                          DER BER     1.5E-14  . 1.6E-13
                                                                             PAGE 1
```

6 JUNE #2

AS-2 LINK STATUS TIME 157/0342:19

		......CY-104......			......TIWBI......	
		HUA	SBL		HUA	SBL
ALARM	SERVICE			OFFICE		
	REMOTE					
STATUS	MAINT			MAINT		
PARAMETER	CHANNEL			FER	<1.0E-6	<1.0E-6
				REFRAME		
SITE ALARMS	ENTRY					
	FIRE					
	AC PWR					
	BATTERY					
	W.A. PR					
	W.G. HV					
	FLOOD					

PAGE 2

IQ-006 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 157/0343:12

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA A	RSLMAR	30.778	29.997	29.417	.98489	29.669	0.0	--------	--------	DB
	EYEMAR	15.014	15.014	9.2879	.53255	9.4032	0.0	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.02960	.12316	.11355	0.0	--------	--------	/SC
HUA B	RSLMAR	29.094	28.168	29.651	3.1601	29.577	0.0	--------	--------	DB
	EYEMAR	3.0369	3.0369	--------	--------	4.8615	2.2521	--------	--------	DB
	RSLAVL	1.0000	1.0000	0.9970	--------	.96622	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	--------	--------	0.9968	--------	--------	--------	RATE
	EYEHIT	.14133	.14133	--------	--------	5.3953	5.6949	--------	--------	/SC
SBL A	RSLMAR	39.250	39.187	39.614	3.0482	40.778	0.0	--------	--------	DB
	EYEMAR	13.369	11.755	12.678	1.0145	12.896	0.0	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	.93788	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	.01169	.00584	5.0724	17.184	.00095	0.0	--------	--------	/SC
SBL B	RSLMAR	35.000	35.611	34.429	3.3400	35.794	0.0	--------	--------	DB
	EYEMAR	9.2973	9.2973	12.572	1.7866	12.917	0.0	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	.98795	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	8.4244	28.091	.00690	0.0	--------	--------	/SC

6 JUNE #3

MAC-3-01-06 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 157/0844:14

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	EYEVOL	-3.6200	-3.6200	-4.1290	.05764	-4.1199	0.0	--------	--------	VLTS
	RXSOH	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
HUA	EYEVOL	-4.7700	-4.7700	--------	--------	-4.5289	.22754	--------	--------	VLTS
B	RXSOH	0.0	0.0	--------	--------	11.000	--------	--------	--------	RTE
HUA	LNKAVL	1.0000	1.0000	1.0000	--------	0.9966	--------	--------	--------	RTE
SBL	EYEVOL	-3.7600	-3.9050	-3.8287	.11569	-3.8016	0.0	--------	--------	VLTS
A	RXSOH	0.0	0.0	9.0000	--------	0.0	--------	--------	--------	RTE
SBL	EYEVOL	-4.1300	-4.1300	-3.8506	.24086	-3.8006	0.0	--------	--------	VLTS
B	RXSOH	0.0	0.0	4.0000	--------	0.0	--------	--------	--------	RTE
SBL	LNKAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE

AS-1 LINK PERFORMANCE ASSESSMENT - T1-4000 TIME 157/0345:06

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.0E-15	3.3E-17	--------	--------	1.7E-10	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	--------	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	--------	--------	1.3333	.94281	--------	--------	RTE
	CR/SOH	0.0	0.0	--------	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	--------	--------	0.0	--------	--------	--------	RTE
H[illegible]	FER	1.0E-15	6.7E-17	1.4E-18	--------	--------	--------	--------	--------	RTE
[illegible]	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	--------	--------	4.0000	3.2660	--------	--------	RTE
	CR/SOH	0.0	0.0	--------	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	--------	--------	0.0	--------	--------	--------	RTE
SBL	FER	1.0E-15	1.0E-16	6.3E-9	--------	5.1E-10	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	6.0000	--------	1.0000	0.0	--------	--------	RTE
	CR/SOH	0.0	0.0	4.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	5.0000	--------	0.0	--------	--------	--------	RTE
SBL	FER	5.2E-10	1.7E-11	3.9E-6	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	4.0000	--------	1.0000	0.0	--------	--------	RTE
	CR/SOH	0.0	0.0	3.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	3.0000	--------	0.0	--------	--------	--------	RTE

6 JUNE # 4

IQ-ØØ7 LINK PERFORMANCE ASSESSMENT - TIWBI TIME 157/0846:Ø8

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
H''	FER	1.2E-14	1.2E-15	7.5E-9	--------	1.ØE-1Ø	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	9.ØØØØ	--------	12.ØØØ	Ø.Ø	--------	--------	RTE
SBL	FER	1.2E-14	4.ØE-16	--------	--------	1.2E-9	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	--------	--------	2.ØØØØ	2.16Ø2	--------	--------	RTE

MAC-3-Ø7-12 MAINTENANCE VOLTAGES - HUA TIME 157/0847:ØØ

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	15.5	.Ø43	153/Ø9Ø7
Ø2	TIWBI+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.4	.ØØ8	153/Ø9Ø7
Ø3	T14ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØ2	153/Ø9Ø7
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø8	Ø	153/Ø9Ø7
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.Ø14	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.Ø1Ø	153/Ø9Ø7

MAINTENANCE VOLTAGES - SBL TIME 157/Ø347:34

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.1	.Ø16	153/Ø911
Ø2	TIWBI+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	.ØØ7	153/Ø911
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø911
Ø	T14ØØØ-6	-6.Ø4	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	.ØØ4	153/Ø911
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.ØØ4	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	2.3E	153/Ø911

```
AS-1                                    SYSTEM OVERVIEW                        TIME  157/0857:59
                HUA        SBL
RADIO A          .          .
      B          .          .
MUX SW           .          .
      A          .          .
      B          .          .
CY104            .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
TIWB1            .R01<><>01R.
                 .          .
                 .          .
TELEMETRY.......................
         .            .        .
SITE     .            .        .
```

#5, 6 June 77

```
IQ   37                                  LINK STATUS                      TIME  157/0859:27
                               ......CY-104......                  ......TIWB1......
                                 HUA          SBL                        HUA      SBL
   ALARM         SERVICE              .                    OFFICE         *    .    *
                                      .                                        .
                                      .                                        .
                 REMOTE               .                                        .
                                      .                                        .
   STATUS        MAINT                .                    MAINT               .
                                      .                                        .
                                      .                                        .
   PARAMETER     CHANNEL              .                    FER     <1.0E-6  .<1.0E-6
                                      .                    REFRAME             .
   SITE          ENTRY                .
   ALARMS        FIRE                 .
                 AC PWR               .
                 BATTERY              .
                 W.A. PR              .
                 W.G. HV              .
                 FLOOD                .                                       PAGE 2
```

MAC-1-18-23 MAINTENANCE VOLTAGES - HUA TIME 157/Ø9Ø3:5Ø

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	.Ø66	R	16.5	15.7	15.Ø	14.2	13.5	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø2	T1WB1+12	.Ø7Ø	R	13.2	12.6	12.Ø	11.4	1Ø.8	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø3	T14ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø5	RADIO+24	23.9	G	26.4	25.2	24.Ø	22.8	21.6	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7

#6, 6 June 77

MAC-1-18-23 MAINTENANCE VOLTAGES - HUA TIME 157/Ø91Ø:23

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.4	G	16.5	15.7	15.Ø	14.2	13.5	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø2	T1WB1+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø5	RADIO+24	23.9	G	26.4	25.2	24.Ø	22.8	21.6	Ø.ØE	Ø.ØE	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	Ø.ØE	Ø.ØE	153/Ø9Ø7

log and supporting display page printouts indicate immediate recognition of the problem on the System Overview Display; verification of the T1WB1 Office Alarm on Link Status, Page 2; and final fault isolation to the T1WB1 power supply utilizing the HUA Maintenance Voltage display.

Illustrating the usefulness of the Maintenance and in-service status indications in providing insight into operational problems, Appendix O scenario, 2 June 1977 is used. This scenario simulates a failure resulting from human error. At Site Sibyl (SBL), the T1-4000 A Maintenance switch is placed ON, and at the same time the XFER to STDB switch on the RX switch module is operated. This signifies the intent by SBL personnel to perform maintenance on the T1-4000 A unit. The tech controller is alerted as will be noted by his log entry at 1347. He uses Maintenance and In-Service information available to him on the System Overview and Link Status, Page 1, displays. At 1350, simulating the maintenance error, the Interface card is extracted from the Standby T1-4000 causing a loss of service. The problem was then quickly isolated using major alarm information on the System Overview and Link Status displays.

Although both are radio parameters, RSL Margin and Eye Margin are used to isolate different kinds of problems which have similar effects on the communication system. As an example of the utility of these two parameters, consider Appendix L, scenario conducted on 8 June 1977. In this scenario, an attenuator in the IF circuit of the "A" radio receiver was used to cause noise figure degradation. In order to prevent the attenuation added to the IF from causing a lower RSL, the AGC from RX A was disconnected from the DATEC monitor point. The monitor point for "A" AGC was then jumpered to the monitor point for "B" AGC. The result is then a degraded noise figure, but no reduction in RSL Margin. The problem was correctly pinpointed to the A receiver by using primarily the Link Status, Page 1, and Link P.A., Page 1 displays.

Utilization of the RSL Margin parameter is clearly illustrated in the Appendix N scenario. This is a two-part test which deals with simulated antenna malalignment. Through the use of attenuators in the waveguides, faulty alignment of just the Transmit/RX A antenna or of both the antennas in the space diversity system may be simulated. Tech Controller work sheets dated 6/1/77 and 6/3/77 illustrate use of the Link P.A., Page 1, display, which has all four RSL Margins (HUA A and B, and SBL A and B) displayed to distinguish between the two types of problems-- single antenna malalignment or both antennas (or tower) malaligned.

As a final example of parameter usefulness, Appendix U scenario, 10 June 1977, depicts use of Frame Error Rate (FER) in fault isolation. An excessively high FER is noted as indicated by the 0807 entry in the Tech Controller's log. The fact that RSL and Eye Margins remain high, point to the High Level Multiplexer as the discrepant area.

PROCEDURE	DATE	TIME
01. At SBL, perform the following steps:		
• Place T1-4000 A MAINT switch on the MAINTENANCE panel of the ARS rack ON.	6-2-77	1345
• Place the XFER to STDB switch up on the T1-4000 4034 RX Switch module.		1345
• Pull the 4091 Interface Unit from the standby T1-4000.		1350
02. At completion of test, restore the equipment to baseline configuration.	6-2-77	1420
CONDUCTED BY C. L. Christney 6-2-77		
OBSERVED BY ______________		

DATEC SYSTEM EVALUATION WORKSHEET 2 June 77 Pg #3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Awaiting test # 3 ..///RR			1300
At 1328, showed amber condition on HUA T1[illegible]1 due to ERR and Reframe... No other indication of problem..ATT, display shows clear.. Will await further events before running any further checks../////RR	11/2 June 77		1345
From CRT display, looks like S L pulling maint on "A" side of T14000.. He now in service on the "B" side...///RR	12/2 June 77		1347
Now showing on CRT, that "B" side of T14000 at SBL has fa iled...chking with them now..///RR	12/2 June 77		1353
Requested maint at SBL to switch back to "A" side of T1-4000, to restore service. attempting to isolate prob. with "B" side ATT...////RR	13/2 June 77		1358
Requested maint at SBL chker out "B" side of T1-4000... Unable to determine what actua lly is wrong with it...////RR			1410
Problem resolved.. Maint at SEL pulled wrong module ???////RR ///Replaced same..///RR	14/2 June 77		1420

TECH CONTROLLER R

OBSERVED BY RBS.

#911 2 June ''

```
AS-1                                 SYSTEM OVERVIEW              TIME  153/1328:29
               HUA        SBL
RADIO A         .          .
      B         .          .
MUX SW          .          .
     A          .          .
     B          .          .
CY104           .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
T1WB1           .A91<      .
                .          .
                .          .
           ......................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .
```

```
IQ-005                             LINK STATUS                     TIME  153/1329:24
                          ......CY-104......                ......T1WB1......
                              HUA        SBL                   HUA       SBL
  ALARM         SERVICE             .              OFFICE            .
                                    .                                .
                                    .                                .
                REMOTE              .                                .
                                    .                                .
                                    .                                .
  STATUS        MAINT               .              MAINT             .
                                    .                                .
                                    .                                .
  PARAMETER     CHANNEL             .              FER      2.7E-5 R.<1.0E-6
                                    .              REFRAME     *     .
                                    .
  SITE          ENTRY               .
  ALARMS        FIRE                .
                AC PWR              .
                BATTERY             .
                W.A. PR             .
                W.G. HV             .
                FLOOD               .                                   PAGE 2
```



```
IQ-?              " PERFORMANCE ASSESSMENT - T1WB1         TIME  153/1?30:2?
```

#12
2 June 77

```
    B          .            .
MUX SW         .         <>R.
     A         .         <>M.
     B         .            .
CY1Ø4          .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
T1WB1          .            .
               .            .
               .            .
            ........................
TELEMETRY.           .             .
          .          .             .
SITE      .          .             .
MAC-1-13-17                     LINK STATUS                       TIME  153/1350:ØØ
                          ......T1-4ØØØ......                    ......RADIO......
                            HUA          SBL                        HUA        SBL
    ALARM        SW MAJOR               .           TX PROB                .
                 SW MINOR               .    *      RX PROB                .
                 MAJOR                  .                                  .
    STATUS       TX IN SVC     A        .    A      TX IN SVC      A       .    A
                 RX IN SVC     A        .    B      RX IN SVC      A       .    A
                 MAINT                  .    A      MAINT                  .
    PARAMETER    FER         <1.ØE-7    .<1.ØE-7    RX SQUELCH             .
                 CRFRM                  .           RSL MARGIN  27.486     . 4Ø.444
                                                    EYE MARGIN  9.4Ø21     . 12.573
                 BER COR     NO DATA    .NO DATA    EYE AMPL   -8.8Ø65     .-8.9677
                                                    EYE HITS       Ø.Ø     .    Ø.Ø
                                                    DER BER     2.2E-11    . 4.7E-13
                                                                           PAGE 1

MAC-3-13-17                     SYSTEM OVERVIEW                   TIME  153/1353:24
               HUA         SBL                     MAJOR ALARM
RADIO A         .            .
      B         .            .
MUX SW          .         <>R.
     A          .R<>      <>M.
     B          .         <>R.
CY1Ø4           .            .
                .            .
                .            .
                .            .
                .            .
                .            .
                .            .
                .            .
                .            .
T1WB1           .RØ1<><>Ø1R.
                .            .
                .            .
            ........................
TELEMETRY.           .             .
          .          .             .
SITE      .          .             .
```

#13 2 June 77

MAC [illegible]-13-17 LINK STATUS TIME 153/1358:52

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.	B			.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	29.615	.	4Ø.444
					EYE MARGIN	9.6Ø9Ø	.	12.573
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8Ø65	.	-8.9677
					EYE HITS	9.728Ø	R.	Ø.Ø
					DER BER	1.7E-11	.	4.7E-13

PAGE 1

AS-1 LINK STATUS TIME 153/1411:Ø3

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.	B			.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	29.167	.	4Ø.222
					EYE MARGIN	9.7148	.	12.573
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8Ø65	.	-8.9677
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.5E-11	.	4.7E-13

PAGE 1

#14
2 June 77

MAC-3-Ø7-12 LINK STATUS TIME 153/142Ø:58

		......T1-4ØØØ......			......RADIO......	
		HUA	SBL		HUA	SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB		
	MAJOR					
STATUS	TX IN SVC	A	A	TX IN SVC	A	A
	RX IN SVC	A	A	RX IN SVC	A	A
	MAINT			MAINT		
PARAMETER	FER	<1.ØE-7	<1.ØE-7	RX SQUELCH		
	CRFRM			RSL MARGIN	27.39Ø	42.222
				EYE MARGIN	9.7148	12.573
	BER COR	NO DATA	NO DATA	EYE AMPL	-8.8Ø65	-8.9677
				EYE HITS	Ø.Ø	Ø.Ø
				DER BER	1.5E-11	4.7E-13

PAGE 1

PROCEDURE	DATE	TIME
L1. At HUA, connect attenuators (X1 and X10) between Equalizer and IF in RX A as shown in Figure L-1.		
L2. With power off the r~~e~~adio and DATEC equipment at HUA, de solder the AGC A lead coming from the radio to the Analog Scanner at Analog Scanner TB1-13. Connect a jumper wire between TB1-13 and 18. Reapply power; put equipment into operation.		
L3. Introduce attenuation at the approximate rate of ~~one~~ two dB every 5 minutes. Do not drop below squelch threshold. Record time when each addition of attenuation is made:		
NOTE: Start with attenuator set to 25 dB		
START		1240
-1dB -2	6/8/77	1245
-2dB -4		1248
-3dB -6		1252
-4dB -8		1258
-5dB -10		1304
-6dB -12		1310
-7dB -14		
-8dB -16		
-9dB -18		
-10dB -20		
-11dB -22		
-12dB -24		
-13dB -26		
-14dB -28		
-15dB -30		
-16dB -32		
-17dB -34		
-18dB -36		
-19dB -38		
-20dB -40		
-21dB		
-22dB		
-23dB		
-24dB		
-25dB		
L4.) Restore equipment to base line condition at completion of test.	6/8/77	1336

CONDUCTED BY C. L. Christney 6-8-77

OBSERVED BY ____________

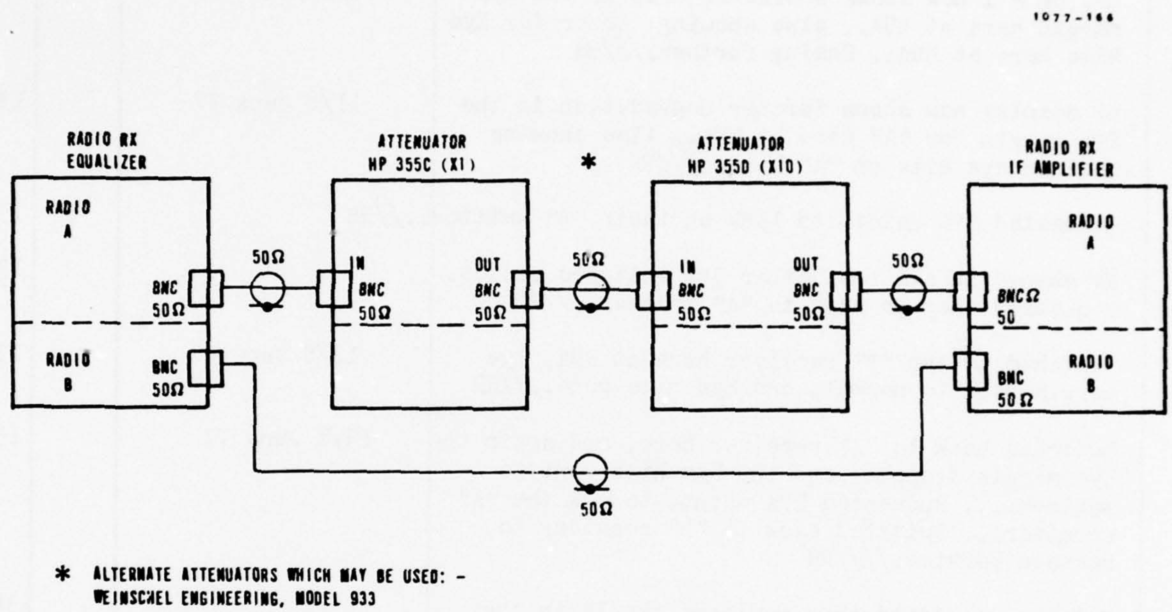


Figure L-1. Test Configuration, Receiver A Versus B Noise Degradation

DNIEC SYSTEM EVALUATION WORKSHEET 8 June ·77 Pg # 2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems green ATT....////RR		6/8	1235
CRT display shows the "B" radio at SBL in amber condition..///RR	10/8 June 77		1251
LS, pg # 1 now shows a drastic drop in the Eye margin here at HUA.. also showing Amber for Eye hits here at HUA.. Chking further.///RR	10/8 June 77		1255
LP display now shows further degradation in the Eye margin for "A" here at HUA.. Also showing Maximum eye hits on "A" here..///RR	11/8 June 77		1304
Requested SBL maint. to lock on their "B" xmitter..//RR			1305
No change in sta tus, after SBL switched radios. Requested they go back to "A" xmitter..//RR			1325
Switched to the "B" receiver here at HUA, Eye margin back to normal, and Eye hits gone..//RR	12/8 June 77		1331
Switched back to "A" receiver here, and again the Eye margin dropped, and the Eye hits went to maximum.... Requested HUA maint, to chk the "A" receiver... Switched back to "B" receiver to restore service.////RR	13/8 June 77		1335
Maintenance advsd they replaced the IF in the "A" receiver, and that it is now good...After chking, found that still seeing maximum eye hits and turned the receiver back to maint..///RR			1345
Maintenance advsd they re-aligned the IF, and "A" now looking good..Switched system back to the "A" side and all fivers..RR			1355
Problem isolated to bad IF within the "A" receiver a t HUA.. Maintenance replaced sa me..//RR			
NOTE: Amber condition at SBL, noted a t 1252, appeared to be caused by a drop in the "B" RSL margin.. This however cleared within approx 5 minutes, and did not affect the system..//RR			

TECH CONTROLLER Cms

OBSERVED BY

```
MAS                                  SYSTEM OVERVIEW              TIME   159/1251:53
              HUA          SBL
RADIO A        .            .
      B        .       >SA.
MUX SW         .            .
     A         .            .
     B         .            .
CY1Ø4          .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
TIWBI          .            .
               .            .
               .            .
          ...........................
TELEMETRY.           .            .
          .           .            .
SITE      .           .            .
```

#10 8 June 77

```
IQ-ØØ7                               LINK STATUS                  TIME   159/1255:Ø8
                              ......T1-4ØØØ......                 .......RADIO......
                                 HUA          SBL                    HUA        SBL
  ALARM       SW MAJOR                  .             TX PROB                .
              SW MINOR                  .             RX PROB                .
              MAJOR                     .                                    .
  STATUS      TX IN SVC          A      .      A      TX IN SVC      A       .      A
              RX IN SVC          A      .      A      RX IN SVC      A       .      A
              MAINT                     .             MAINT                  .
  PARAMETER   FER            <1.ØE-7    .<1.ØE-7      RX SQUELCH             .
              CRFRM                     .             RSL MARGIN   29.423    . 4Ø.444
                                                      EYE MARGIN   4.2393    . 13.714
              BER COR        NO DATA    .NO DATA      EYE AMPL    -8.8Ø65    .-8.9677
                                                      EYE HITS     .59244 A.    Ø.Ø
                                                      DER BER      3.7E-9    . 9.7E-14
                                                                          PAGE 1
```

\# 11 8 June 27

MAC-1-08-10 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 159/1304:31

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
F.	RSLMAR	34.000	29.956	6.1862	11.083	25.066	9.1740	--------	--------	DB
A	EYEMAR	-5.1056	8.6336	.38853	5.8017	9.1217	4.2871	--------	--------	DB
	RSLAVL	1.0000	1.0000	.36145	--------	.84815	--------	--------	--------	RATE
	EYEAVL	0.0	1.0000	.35878	--------	.85143	--------	--------	--------	RATE
	EYEHIT	364.09	.29622	178.34	109.27	33.108	66.134	--------	--------	/SC
HUA	RSLMAR	28.932	29.133	32.494	1.7115	30.682	2.0236	--------	--------	DB
B	EYEMAR	5.5670	5.6637	9.8185	2.5079	6.5218	2.7858	--------	--------	DB
	RSLAVL	1.0000	1.0000	0.9959	--------	.98701	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9978	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	4.1507	4.9477	--------	--------	/SC
SBL	RSLMAR	41.667	38.903	38.538	1.1887	39.132	1.1168	--------	--------	DB
A	EYEMAR	13.714	13.714	13.544	.34402	12.769	.56043	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9956	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.01710	.07455	3.0423	4.0440	--------	--------	/SC
SBL	RSLMAR	35.583	33.527	33.857	.77144	34.701	.86241	--------	--------	DB
B	EYEMAR	14.660	14.421	13.562	.38009	12.334	1.5540	--------	--------	DB
	RSLAVL	1.0003	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9957	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	1.6863	3.3690	--------	--------	/SC

131° switched traffic to SBL,

1325Z

#12 8 June 77

MAC-1-Ø8-1Ø LINK PERFORMANCE ASSESSMENT - RADIOS TIME 159/1318:25

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	29.423	29.896	6.1996	11.111	25.366	9.1740	--------	--------	DB
A	EYEMAR	-18.962	3.1252	.38853	5.8017	9.1217	4.2671	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.34Ø25	--------	.84815	--------	--------	--------	RATE
	EYEAVL	Ø.Ø	.66667	.35878	--------	.85143	--------	--------	--------	RATE
	EYEHIT	364.ØØ	121.56	178.34	179.27	33.198	66.134	--------	--------	/SC
HUA	RSLMAR	26.625	27.745	32.488	1.7229	30.682	2.Ø236	--------	--------	DB
B	EYEMAR	11.562	11.562	9.8185	2.5Ø81	6.5213	2.7358	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	Ø.9958	--------	.937Ø1	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9973	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	4.15Ø7	4.9477	--------	--------	/SC
SBL	RSLMAR	39.75Ø	39.75Ø	38.634	1.1282	39.132	1.1168	--------	--------	DB
A	EYEMAR	13.714	13.714	13.584	.31364	12.769	.56Ø43	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.[illegible]	--------	Ø.9956	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø171Ø	.Ø7455	3.Ø423	4.Ø444	--------	--------	/SC
SBL	RSLMAR	33.455	33.455	33.[illegible]	.753Ø1	34.7Ø1	.86241	--------	--------	DB
B	EYEMAR	14.66Ø	14.421	13.562	.38999	12.334	1.554Ø	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9957	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	1.6863	3.369Ø	--------	--------	/SC

MAS LINK STATUS TIME 159/1331:45

		......T1-4ØØØ...... HUA	SBL		......RADIO...... HUA	SBL
ALARM	SW MAJOR		.	TX PROB		.
	SW MINOR		.	RX PROB		.
	MAJOR		.			.
STATUS	TX IN SVC	A	. A	TX IN SVC	A	. A
	RX IN SVC	A	. A	RX IN SVC	B	. A
	MAINT		.	MAINT		.
PARAMETER	FER	<1.ØE-7	.<1.ØE-7	RX SQUELCH		.
	CRFRM		.	RSL MARGIN	29.453	. 38.1ØØ
				EYE MARGIN	5.567Ø	. 13.714
	BER COR	NO DATA	.NO DATA	EYE AMPL	-9.0741	.-8.9355
				EYE HITS	Ø.Ø	. Ø.Ø
				DER BER	1.1E-9	. 9.7E-14

PAGE 1

#13 8 June 77

MAS

LINK STATUS

TIME 159/1333:19

		......T1-4000......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.0E-7	.	<1.0E-7	RX SQUELCH		.	*
	CRFRM		.		RSL MARGIN	26.610	.	38.600
					EYE MARGIN	-10.776	R.	13.714
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.5484	.	-8.9355
					EYE HITS	364.09	R.	0.0
					DER BER	1.1E-9	.	9.7E-14

PAGE 1

MAS

LINK STATUS

TIME 159/1335:12

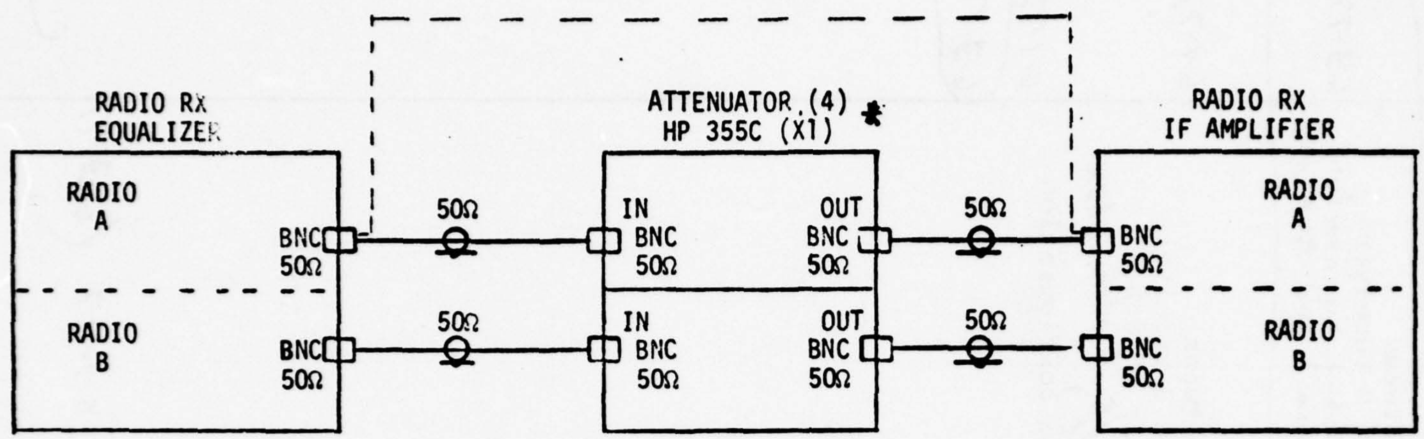
		......T1-4000......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	B	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.0E-7	.	<1.0E-7	RX SQUELCH		.	*
	CRFRM		.		RSL MARGIN	28.447	.	38.600
					EYE MARGIN	5.5670	.	13.714
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-9.0741	.	-8.9355
					EYE HITS	0.0	.	0.0
					DER BER	1.1E-9	.	9.7E-14

PAGE 1

PROCEDURE	DATE	TIME
Reciprocal Path Problem		
N1. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at both HUA and SBL. (Accomplished by inserting 10dB of attenuation in both transmit and RX A wave-guides @ SBL)	6-3-77	0845
Transmit Antenna Only at Sibyl		
N2. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at HUA and the B receiver only at SBL. (Accomplished by inserting 10dB of attenuation in transmit waveguide @ SBL)	6-1-77	0832
N3. Restore equipment to baseline configuration	6-1-77	0900
	6-3-77	1015

CONDUCTED BY C L Christner 6-1-77 (6-3-77

OBSERVED BY ____________



NOTE: Simultaneously at both HUA and SBL for step N1.
Both receivers at HUA and B receiver only at SBL for step N2.

Figure N-1. Test Configuration, Antenna Misalignment

* Alternate attenuators which may be used :–
WEINSCHEL ENGINEERING, Model 933.

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Collecting system data, and charting RSL thresholds on "A" and "B" radions at HUA....////RR No alarms or fauly indications are pres nt..//RR	1-6/1 June 77	6/1	[illegible]
Showing Ctl Refrm on TL4000, and Refrm on TLWB1 at SBL..../ //RR			0823
Showing at SBL, amber on TLWB1 and TL4000, and at HUA amber on both radio recvrs...B recvr at SBL also amber....////RR			0835
RSL margin at HUA is amber...Reframes on TLWB1 at SBL cleared...///RR			0836
RSL on both "A" & "B" at HUA are amber..///RR Suspect output pwr prob at SBL.. Chking further..../ //RR			0838
RSL on both recvrs at HUA still down.. Also showing low RSL on "B" radio at SBL...???////RR	6/1 June 77		0845
Based on 0845 entry, appears to be attenna alignment at SBL...System is operating on space diversity, so alingment problem appears to be the cause of problem...////RR///transmit anttenna at SBL..////RR Test # 1 for today complete////RR			0851

TECH CONTROLLER S

OBSERVED BY

RADIO A
B
UX SW
A
B
CY1Ø4

#1
1 June 77

TIWBI

TELEMETRY.

SITE

BEM-3-MØ-I2 LINK STATUS TIME 152/Ø811:23

		......TI-4ØØØ...... HUA	SBL		......RADIO...... HUA	SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB		
	MAJOR					
STATUS	TX IN SVC	A	A	TX IN SVC	A	A
	RX IN SVC	A	A	RX IN SVC	A	A
	MAINT			MAINT		
PARAMETER	FER	<1.ØE-7	<1.ØE-7	RX SQUELCH		
	CRFRM			RSL MARGIN	29.936	41.444
				EYE MARGIN	9.6Ø9Ø	13.714
	BER COR	NO DATA	NO DATA	EYE AMPL	-8.8Ø65	-8.9355
				EYE HITS	Ø.Ø	.ØØ449
				DER BER	1.7E-11	9.7E-14

PAGE 1

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*AS                                   LINK STATUS                       TIME  152/0812:33
                              ......CY-104......                 ......TIWB1......
                              HUA          SBL                      HUA        SBL
  ALARM        SERVICE             .                  OFFICE           .
                                   .                                   .
               REMOTE              .                                   .
                                   .                                   .
                                   .                                   .
  STATUS       MAINT               .                  MAINT            .
                                   .                                   .
                                   .                                   .
  PARAMETER    CHANNEL             .                  FER    <1.0E-6   .<1.0E-6
                                   .                  REFRAME          .
                                   .
  SITE         ENTRY               .
  ALARMS       FIRE                .
               AC PWR              .
               BATTERY             .
               W.A. PR             .
               W.G. HV             .
               FLOOD               .                                   PAGE 2
```

#2 1JUN77

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AS-2                    LINK PERFORMANCE ASSESSMENT - RADIOS        TIME  152/0814:11
                 LAST   LAST HR    LAST 24 HR       LAST 30 DAYS      LAST 30 MTHS
                 SCAN    MEAN    MEAN      DEV      MEAN     DEV      MEAN     DEV
HUA  RSLMAR   29.615   29.776 ------------------------------------------------- DB
 A   EYEMAR   9.6090   9.6090 ------------------------------------------------- DB
     RSLAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEHIT      0.0      0.0 ------------------------------------------------- /SC
HUA  RSLMAR   30.846   31.095 ------------------------------------------------- DB
 B   EYEMAR   4.1460 ---------------------------------------------------------- DB
     RSLAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEAVL   1.0000 ---------------------------------------------------------- RATE
     EYEHIT   293.09 ---------------------------------------------------------- /SC
SBL  RSLMAR   41.444   41.444 ------------------------------------------------- DB
 A   EYEMAR   13.714   13.714 ------------------------------------------------- DB
     RSLAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEHIT   .00449   .00449 ------------------------------------------------- /SC
SBL  RSLMAR   34.200   34.200 ------------------------------------------------- DB
 B   EYEMAR   14.065 ---------------------------------------------------------- DB
     RSLAVL   1.0000   1.0000 ------------------------------------------------- RATE
     EYEAVL   1.0000 ---------------------------------------------------------- RATE
     EYEHIT      0.0 ---------------------------------------------------------- /SC
```

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MAC-1-07-12               LINK PERFORMANCE ASSESSMENT - RADIOS      TIME  152/0815:37
                LAST   LAST HR   LAST 24 HR      LAST 30 DAYS     LAST 30 MTHS
                SCAN     MEAN   MEAN     DEV     MEAN     DEV     MEAN     DEV
 HUA EYEVOL-4.1000  -4.1000 ------------------------------------------------------- VLTS
  A  RXSQH     0.0      0.0 ------------------------------------------------------- RTE
 HUA EYEVOL-4.7200  -4.7200 ------------------------------------------------------- VLTS
  B  RXSQH     0.0      0.0 ------------------------------------------------------- RTE
 HUA LNKAVL 1.0000   1.0000 ------------------------------------------------------- RTE
 SBL EYEVOL-3.7300  -3.7300 ------------------------------------------------------- VLTS
  A  RXSQH     0.0      0.0 ------------------------------------------------------- RTE
 SBL EYEVOL-3.7000 ---------------------------------------------------------------- VLTS
  B  RXSQH     0.0      0.0 ------------------------------------------------------- RTE
 SBL LNKAVL 1.0000   1.0000 ------------------------------------------------------- RTE
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#3
1JUN77

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IQ-005                    LINK PERFORMANCE ASSESSMENT - T1-4000     TIME  152/0816:51
                LAST   LAST HR   LAST 24 HR      LAST 30 DAYS     LAST 30 MTHS
                SCAN     MEAN   MEAN     DEV     MEAN     DEV     MEAN     DEV
 HUA FER     1.0E-15 3.3E-17--------------------------------------------------------- RTE
  A  FERAVL 1.0000   1.0000 ------------------------------------------------------- RTE
     CRFRM     0.0      0.0 ------------------------------------------------------- RTE
     CR/SQH    0.0      0.0 ------------------------------------------------------- RTE
     CR/HIT    0.0      0.0 ------------------------------------------------------- RTE
 HUA FER     1.0E-15----------------------------------------------------------------- RTE
  B  FERAVL 1.0000 ----------------------------------------------------------------- RTE
     CRFRM     0.0      0.0 ------------------------------------------------------- RTE
     CR/SQH    0.0      0.0 ------------------------------------------------------- RTE
     CR/HIT    0.0      0.0 ------------------------------------------------------- RTE
 SBL FER     1.0E-15 3.3E-17--------------------------------------------------------- RTE
  A  FERAVL 1.0000   1.0000 ------------------------------------------------------- RTE
     CRFRM     0.0      0.0 ------------------------------------------------------- RTE
     CR/SQH    0.0      0.0 ------------------------------------------------------- RTE
     CR/HIT    0.0      0.0 ------------------------------------------------------- RTE
 SBL FER     1.8E-5 ------------------------------------------------------------------ RTE
  B  FERAVL 1.0000 ----------------------------------------------------------------- RTE
     CRFRM     0.0      0.0 ------------------------------------------------------- RTE
     CR/SQH    0.0      0.0 ------------------------------------------------------- RTE
     CR/HIT    0.0      0.0 ------------------------------------------------------- RTE
```

#4 1 June 77

AS-2 LINK PERFORMANCE ASSESSMENT - TIWB1 TIME 152/Ø818:ØØ

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.2E-14	8.ØE-16	----	----	----	----	----	----	RTE
	RFRM	Ø.Ø	Ø.Ø	----	----	----	----	----	----	RTE
SBL	FER	1.2E-14	4.ØE-16	----	----	----	----	----	----	RTE
	RFRM	Ø.Ø	Ø.Ø	----	----	----	----	----	----	RTE

MAS MAINTENANCE VOLTAGES - HUA TIME 152/Ø819:24

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	Ø.ØE	Ø.ØE	152/Ø812
Ø2	TIWBI+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	Ø.ØE	Ø.ØE	152/Ø812
Ø3	TI4ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	Ø.ØE	Ø.ØE	152/Ø812
Ø4	TI4ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	Ø.ØE	Ø.ØE	152/Ø812
Ø5	RADIO+24	23.9	G	26.4	25.2	24.Ø	22.8	21.6	Ø.ØE	Ø.ØE	152/Ø812
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	Ø.ØE	Ø.ØE	152/Ø812

#5 1 June 77

MAS MAINTENANCE VOLTAGES - SBL TIME 152/0820:28

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	TIWBI+15	15.2	G	16.5	15.7	15.0	14.2	13.5	0.0E	0.0E	000/0000
02	TIWBI+12	12.3	G	13.2	12.6	12.0	11.4	10.8	0.0E	0.0E	000/0000
03	TI4000+5	4.95	G	5.50	5.25	5.00	4.75	4.50	0.0E	0.0E	000/0000
04	TI4000-6	-6.03	G	-5.40	-5.70	-6.00	-6.30	-6.60	0.0E	0.0E	000/0000
05	RADIO+24	24.0	G	26.4	25.2	24.0	22.8	21.6	0.0E	0.0E	000/0000
06	RADIO-20	-20.1	G	-18.0	-19.0	-20.0	-21.0	-22.0	0.0E	0.0E	000/0000

-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 152/0845:19

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
JA	RSLMAR	19.879	25.204	----	----	----	----	----	----	DB
	EYEMAR	8.9786	9.4698	----	----	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEHIT	0.0	0.0	----	----	----	----	----	----	/SC
JA	RSLMAR	21.746	26.346	----	----	----	----	----	----	DB
3	EYEMAR	3.4940	3.2517	----	----	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEAVL	1.0003	1.0000	----	----	----	----	----	----	RATE
	EYEHIT	.14133	.07664	----	----	----	----	----	----	/SC
3L	RSLMAR	40.222	41.400	----	----	----	----	----	----	DB
	EYEMAR	13.597	13.714	----	----	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEHIT	0.0	.00150	----	----	----	----	----	----	/SC
3L	RSLMAR	24.583	32.224	----	----	----	----	----	----	DB
	EYEMAR	13.943	13.890	----	----	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	----	----	----	----	----	----	RATE
	EYEHIT	1.0969	.54844	----	----	----	----	----	----	/SC

#7 1 June 77

1S LINK PERFORMANCE ASSESSMENT - RADIOS TIME 152/0956:54

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
A	RSLMAR	28.873	29.411	24.153	0.0	----	----	----	----	DB
	EYEMAR	15.254	13.703	9.3733	0.0	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEHIT	0.0	0.0	0.0	0.0	----	----	----	----	/SC
A	RSLMAR	30.276	30.641	25.324	0.0	----	----	----	----	DB
	EYEMAR	9.8217	9.7950	3.3417	0.0	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEHIT	0.0	.01800	.03759	0.0	----	----	----	----	/SC
L	RSLMAR	31.455	36.394	40.144	0.0	----	----	----	----	DB
	EYEMAR	13.369	13.187	13.714	0.0	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEHIT	0.0	0.0	.00112	0.0	----	----	----	----	/SC
3L	RSLMAR	29.538	34.639	31.347	0.0	----	----	----	----	DB
3	EYEMAR	12.800	13.566	14.096	0.0	----	----	----	----	DB
	RSLAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEAVL	1.0000	1.0000	1.0000	----	----	----	----	----	RATE
	EYEHIT	0.0	0.0	.21938	0.0	----	----	----	----	/SC

PROCEDURE	DATE	TIME
Reciprocal Path Problem		
N1. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at both HUA and SBL. (Accomplished by inserting 10dB of attenuation in both transmit and RX A waveguides @ SBL)	6-3-77	0845
Transmit Antenna Only at Sibyl		
N2. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at HUA and the B receiver only at SBL. (Accomplished by inserting 10dB of attenuation in transmit waveguide @ SBL)	6-1-77	[illegible]32
N3. Restore equipment to baseline configuration	6-1-77	
	6-3-77	1015

CONDUCTED BY C L Christner 6-1-77 / 6-3-77

OBSERVED BY ____________________

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Awaiting test ATT..Systems clear..System data attached../////RR	1-5/3 June 77	6/3	0807
CRT showing Red on RSL margin here at HUA.. Also showing Amber conditions on both "A" & "B" radios here and on "B" at SBL..///RR	6/3 June 77		0847
Now showing Amber on SBL RSL margin...///RR	7/June 77		0855
Requested maint at SBL chker his antenna alignment..///RR	8/3 June 77		0902
System fivers att, SBL maint corrected prob..//RR	8/3 June 77		0908

TECH CONTROLLER R

OBSERVED BY [illegible]

#1 3 June 77

```
MAC-1-07-12                      SYSTEM OVERVIEW                    TIME  154/0752:19
                HUA        SBL
RADIO A          .          .
      B          .          .
MUX SW           .          .
     A           .          .
     B           .          .
CY104            .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
                 .          .
T1WB1            .          .
                 .          .
                 .          .
             ......................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .


AS-1                              LINK STATUS                        TIME  154/0753:13
                            ......T1-4000......                     ......RADIO......
                              HUA        SBL                          HUA        SBL
  ALARM        SW MAJOR               .            TX PROB                  .
               SW MINOR               .            RX PROB                  .
               MAJOR                  .                                     .
  STATUS       TX IN SVC       A      .    A       TX IN SVC        A       .    A
               RX IN SVC       A      .    A       RX IN SVC        A       .    A
               MAINT                  .            MAINT                    .
  PARAMETER    FER         <1.0E-7  .<1.0E-7       RX SQUELCH               .
               CRFRM                  .            RSL MARGIN    28.873  . 42.000
                                      .            EYE MARGIN    9.5055  . 12.914
               BER COR     NO DATA  .NO DATA       EYE AMPL     -8.8065  .-8.9677
                                                   EYE HITS         0.0  .    0.0
                                                   DER BER      2.0E-11  . 3.0E-13
                                                                           PAGE 1
```

#2 3 June 77

```
IQ-005                          LINK STATUS                        TIME  154/0754:04
                          ......CY-104......                   ......TIWBI......
                               HUA        SBL                        HUA       SBL
   ALARM          SERVICE            .               OFFICE            .
                                     .                                 .
                                     .                                 .
                  REMOTE             .                                 .
                                     .                                 .
                                     .                                 .
                                     .                                 .
   STATUS         MAINT              .               MAINT             .
                                     .                                 .
                                     .                                 .
   PARAMETER      CHANNEL            .               FER    <1.0E-6    .<1.0E-6
                                     .               REFRAME           .
                                     .
   SITE           ENTRY              .
   ALARMS         FIRE               .
                  AC PWR             .
                  BATTERY            .
                  W.A. PR            .
                  W.G. HV            .
                  FLOOD              .                                     PAGE 2
```

MAC-1-13-17 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 154/0754:56

		LAST	LAST HR	LAST 24 HR		LAST 30 DAYS		LAST 30 MTHS		
		SCAN	MEAN	MEAN	DEV	MEAN	DEV	MEAN	DEV	
HUA	RSLMAR	28.873	29.970	29.655	.90374	-----	-----	-----	-----	DB
A	EYEMAR	9.5055	9.4796	9.3995	.41433	-----	-----	-----	-----	DB
	RSLAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEHIT	0.0	.00298	.11860	.50575	-----	-----	-----	-----	/SC
HUA	RSLMAR	30.683	31.797	29.480	8.5086	-----	-----	-----	-----	DB
B	EYEMAR	2.4979	2.1163	4.0945	3.4159	-----	-----	-----	-----	DB
	RSLAVL	1.0000	1.0000	.96491	-----	-----	-----	-----	-----	RATE
	EYEAVL	1.0000	1.0000	.99301	-----	-----	-----	-----	-----	RATE
	EYEHIT	.14667	.09493	4.2647	13.853	-----	-----	-----	-----	/SC
SBL	RSLMAR	42.000	40.257	40.790	.76406	-----	-----	-----	-----	DB
A	EYEMAR	12.914	12.914	12.895	.45695	-----	-----	-----	-----	DB
	RSLAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEHIT	0.0	0.0	.00099	.00383	-----	-----	-----	-----	/SC
SBL	RSLMAR	36.667	36.500	35.763	1.0725	-----	-----	-----	-----	DB
B	EYEMAR	13.482	13.170	12.906	.52788	-----	-----	-----	-----	DB
	RSLAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEAVL	1.0000	1.0000	1.0000	-----	-----	-----	-----	-----	RATE
	EYEHIT	0.0	0.0	.00721	.03257	-----	-----	-----	-----	/SC

#3 3 June 77

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 154/0756:03

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	DEV	LAST 30 DAYS MEAN	DEV	LAST 30 MTHS MEAN	DEV	
HUA	EYEVOL	-4.1100	-4.1125	-4.1202	.03912	------	------	------	------	VLTS
A	RXSQH	0.0	0.0	0.0	------	------	------	------	------	RTE
HUA	EYEVOL	-4.8300	-4.8733	-4.4945	1.0209	------	------	------	------	VLTS
B	RXSQH	0.0	0.0	3.0000	------	------	------	------	------	RTE
HUA	LNKAVL	1.0000	1.0000	0.9964	------	------	------	------	------	RTE
SBL	EYEVOL	-3.8000	-3.8000	-3.8017	.04023	------	------	------	------	VLTS
A	RXSQH	0.0	0.0	0.0	------	------	------	------	------	RTE
SBL	EYEVOL	-3.7500	-3.7775	-3.8015	.04972	------	------	------	------	VLTS
B	RXSQH	0.0	0.0	0.0	------	------	------	------	------	RTE
SBL	LNKAVL	1.0000	1.0000	1.0000	------	------	------	------	------	RTE

G01HUA

#4 3 June 77

MAS LINK PERFORMANCE ASSESSMENT - TI-4000 TIME 154/08[illegible]:41

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.0E-15	3.3E-16	3.9E-16						RTE
A	FERAVL	1.0000	1.0000	1.0000						RTE
	CRFRM	0.0	0.0	2.0000						RTE
	CR/SQH	0.0	0.0	0.0						RTE
	CR/HIT	0.0	0.0	0.0						RTE
HUA	FER	1.0E-15	3.3E-17							RTE
B	FERAVL	1.0000	1.0000	1.0000						RTE
	CRFRM	0.0	1.0000	3.0000						RTE
	CR/SQH	0.0	0.0	0.0						RTE
	CR/HIT	0.0	0.0	0.0						RTE
SBL	FER	1.0E-15	3.0E-16	1.5E-8						RTE
A	FERAVL	1.0000	1.0000	1.0000						RTE
	CRFRM	0.0	0.0	1.0000						RTE
	CR/SQH	0.0	0.0	0.0						RTE
	CR/HIT	0.0	0.0	0.0						RTE
SBL	FER	5.2E-10	1.7E-11	3.9E-6						RTE
B	FERAVL	1.0000	1.0000	1.0000						RTE
	CRFRM	0.0	0.0	1.0000						RTE
	CR/SQH	0.0	0.0	0.0						RTE
	CR/HIT	0.0	0.0	0.0						RTE

IQ-008 LINK PERFORMANCE ASSESSMENT - TIWB1 TIME 154/0801:36

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.2E-14	4.0E-15	3.0E-9						RTE
	RFRM	0.0	1.0000	11.000						RTE
SBL	FER	1.2E-14	4.0E-15	4.7E-15						RTE
	RFRM	0.0	0.0	1.0000						RTE

#5 3 June 77

MAC -13-17 MAINTENANCE VOLTAGES - SBL TIME 154/Ø8Ø2:21

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.1	G	16.5	15.7	15.Ø	14.2	13.5	15.1	.Ø2Ø	153/Ø911
Ø2	TIWBI+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	.ØØ7	153/Ø911
Ø3	TI4ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø911
Ø4	TI4ØØØ-6	-6.Ø5	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	.ØØ4	153/Ø911
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.Ø1Ø	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	1.6E	153/Ø911

MAC-3-18-23 MAINTENANCE VOLTAGES - HUA TIME 154/Ø8Ø3:18

NO	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	15.5	.Ø46	153/Ø9Ø7
Ø2	TIWBI+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.4	.Ø17	153/Ø9Ø7
Ø3	TI4ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØ6	153/Ø9Ø7
Ø4	TI4ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø8	Ø	153/Ø9Ø7
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.Ø26	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.ØØ9	153/Ø9Ø7

\# 6

3 June 77

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                                  LINK STATUS                   TIME  154/0347:49
                           ......T1-4000......             ......RADIO......
                              HUA            SBL                  HUA          SBL
ALARM        SW MAJOR                  .            TX PROB                 .
             SW MINOR                  .            RX PROB                 .
             MAJOR                     .                                    .
STATUS       TX IN SVC         A       .     A      TX IN SVC      A        .     A
             RX IN SVC         A       .     A      RX IN SVC      A        .     A
             MAINT                     .            MAINT                   .
PARAMETER    FER           <1.0E-7    .<1.0E-7      RX SQUELCH              .
             CRFRM                     .            RSL MARGIN   16.540 R.  32.071
                                                    EYE MARGIN   9.6490  .  12.459
             BER COR       NO DATA    .NO DATA      EYE AMPL    -8.8065  .-8.9677
                                                    EYE HITS        0.0  .     0.0
                                                    DER BER     1.7E-11  . 5.5E-13
                                                                         PAGE 1
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```
IQ-008                         SYSTEM OVERVIEW                  TIME  154/0349:00
                HUA        SBL
RADIO A         .AI<        .
      B         .AS<     >SA.
MUX SW          .           .
      A         .           .
      B         .           .
CY104           .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
T1WB1           .           .
                .           .
                .           .
                .           .
            ......................
TELEMETRY.            .           .
          .           .           .
SITE      .           .           .
```

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MAC-3-18-23                 MAINTENANCE VOLTAGES - SBL          TIME  154/0350:37
                                                                          INITIAL
NO.   NAME      VOLTS   C     RH     AH     CG     AL     RL   MEAN   DEV   DATE
01  T1WB1+15     15.2   G    16.5   15.7   15.0   14.2   13.5   15.1  .019 153/0911
02  T1WB1+12     12.3   G    13.2   12.6   12.0   11.4   10.8   12.3  .007 153/0911
03  T14000+5     4.95   G    5.50   5.25   5.00   4.75   4.50   4.95     0 153/0911
04  T14000-6    -6.04   G   -5.40  -5.70  -6.00  -6.30  -6.60  -6.04  .004 153/0911
05  RADIO+24     24.1   G    26.4   25.2   24.0   22.8   21.6   24.1  .010 153/0911
06  RADIO-20    -20.1   G   -18.0  -19.0  -20.0  -21.0  -22.0  -20.1     0 153/0911
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```
MAC-3-07-12                           LINK STATUS                      TIME  154/0855:49
                              ......T1-4000......                ......RADIO......
                                 HUA          SBL                      HUA          SBL
  ALARM        SW MAJOR                .                RX PROB              .
               SW MINOR                .                RX PROB              .
               MAJOR                   .                                     .
  STATUS       TX IN SVC         A     .     A          TX IN SVC      A     .     A
               RX IN SVC         A     .     A          RX IN SVC      A     .     A
               MAINT                   .                MAINT                .
  PARAMETER    FER          <1.0E-7  .<1.0E-7           RX SQUELCH           .
               CRFRM                   .     .          RSL MARGIN   16.944 R. 30.182 A
                                                        EYE MARGIN   9.6090  . 12.459
               BER COR      NO DATA  .NO DATA           EYE AMPL    -8.8065  .-8.9677
                                                        EYE HITS        0.0  .    0.0
                                                        DER BER     1.7E-11  . 5.5E-13

                                                                          PAGE 1
```

#7
3 June 77

```
AS-2                  LINK PERFORMANCE ASSESSMENT - RADIOS       TIME  154/0857:21
                LAST  LAST HR   LAST 24 HR      LAST 30 DAYS     LAST 30 MTHS
                SCAN    MEAN    MEAN     DEV    MEAN     DEV     MEAN     DEV
HUA RSLMAR  16.944  26.490  29.669  .88694 -------------------------------- DB
 A  EYEMAR  9.6090  9.3738  9.4032  .40560 -------------------------------- DB
    RSLAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEHIT     0.0     0.0  .11355  .49520 -------------------------------- /SC
HUA RSLMAR  19.355  28.422  29.577  8.3423 -------------------------------- DB
 B  EYEMAR  1.8693  3.3048  4.0121  3.3673 -------------------------------- DB
    RSLAVL  1.0000  1.0000  .96622 ----------------------------------------- RATE
    EYEAVL  1.0000  1.0000  0.9932 ----------------------------------------- RATE
    EYEHIT  .14400  .08640  4.0908  13.586 -------------------------------- /SC
SBL RSLMAR  30.182  39.868  40.778  .75007 -------------------------------- DB
 A  EYEMAR  12.459  12.545  12.896  .44646 -------------------------------- DB
    RSLAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEHIT     0.0     0.0  .00095  .00374 -------------------------------- /SC
SBL RSLMAR  24.417  32.474  35.794  1.0606 -------------------------------- DB
 B  EYEMAR  13.255  13.210  12.917  .51850 -------------------------------- DB
    RSLAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEAVL  1.0000  1.0000  1.0000 ----------------------------------------- RATE
    EYEHIT     0.0     0.0  .00690  .03188 -------------------------------- /SC
K11 1.0000  1.0000  .96622 ------------------------------------
```

#8
3 June 77

```
IQ-008                             LINK STATUS                          TIME  154/0900:21
                             ......T1-4000......                       ......RADIO......
                                  HUA          SBL                           HUA        SBL
  ARM       SW MAJOR                      .                TX PROB                .
            SW MINOR                      .                RX PROB                .
            MAJOR                         .                                       .
STATUS      TX IN SVC             A       .     A          TX IN SVC       A      .      A
            RX IN SVC             A       .     A          RX IN SVC       A      .      A
            MAINT                         .                MAINT                  .
PARAMETER   FER              <1.0E-7      .<1.0E-7         RX SQUELCH             .
            CRFRM                         .                RSL MARGIN   19.369 A. 30.182 A
                                                           EYE MARGIN   9.6090  . 12.459
            BER COR          NO DATA      .NO DATA         EYE AMPL    -8.8065  .-8.9677
                                                           EYE HITS        0.0  .    0.0
                                                           DER BER     1.7E-11  . 5.5E-13
                                                                              PAGE 1

MAS                                LINK STATUS                          TIME  154/0906:15
                             ......T1-4000......                       ......RADIO......
                                  HUA          SBL                           HUA        SBL
ALARM       SW MAJOR                      .                TX PROB                .
            SW MINOR                      .                RX PROB                .
            MAJOR                         .                                       .
STATUS      TX IN SVC             A       .     A          TX IN SVC       A      .      A
            RX IN SVC             A       .     A          RX IN SVC       A      .      B
            MAINT                         .                MAINT                  .
 RAMETER    FER              <1.0E-7      .<1.0E-7         RX SQUELCH             .
            CRFRM                         .                RSL MARGIN   29.423  . 35.500
                                                           EYE MARGIN   9.7148  . 13.028
            BER COR          NO DATA      .NO DATA         EYE AMPL    -8.8065  .-8.9677
                                                           EYE HITS        0.0  .    0.0
                                                           DER BER     1.5E-11  . 5.5E-13
                                                                              PAGE 1

IQ-008                             LINK STATUS                          TIME  154/0908:44
                             ......T1-4000......                       ......RADIO......
                                  HUA          SBL                           HUA        SBL
ALARM       SW MAJOR                      .                TX PROB                .
            SW MINOR                      .                RX PROB                .
            MAJOR                         .                                       .
STATUS      TX IN SVC             A       .     A          TX IN SVC       A      .      A
            RX IN SVC             A       .     A          RX IN SVC       A      .      A
            MAINT                         .                MAINT                  .
PARAMETER   FER              <1.0E-7      .<1.0E-7         RX SQUELCH             .
            CRFRM                         .                RSL MARGIN   29.423  . 39.5[illegible]
                                                           EYE MARGIN   9.7148  . 12.8[illegible]
            BER COR          NO DATA      .NO DATA         EYE AMPL    -8.8065  .-8.[illegible]677
                                                           EYE HITS        0.0  .    0.0
                                                           DER BER     1.5E-11  . 3.5E-13
                                                                              PAGE 1
```

PROCEDURE	DATE	TIME
U1. Install the Frame Bit Error Generator (FBEG) between the radio and TI-4000 in the RX baseband input line at SBL.	6/10/77	
U2. With the selector switch of the FBEG set to NARROW, momentarily depress the pushbutton switch several times (3-5). Repeat this operation at a rate of approxiamtely once every 5 minutes. Record the time when each operation is performed.		0800
Perturbation No. 1		0800
" " 2		0804
" " 3		0808
" " 4		0812
" " 5		0816
" " 6		0820
" " 7		0824
" " 8		
" " 9		
" " 10		
COMPLETED		0850
U3. When test is completed, restore equipment to baseline configuration.		
CONDUCTED BY T. J. Campbell 6/10/77		
OBSERVED BY		

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All systems clear...Base Line data...//cs	1-4/ 10June 77	6/10	0750
CRT systems Overview indicates a problem with SBL's T1-4000 mux..bad FER...//dg	5/10June 77 6/10 June		0807
Check ra dio RSL's, Maint voltages a ppeared OK. Request Maint switch T1-4000 recv "A" to recv "B".			082 0
System is good with the "B" mux recv ...asked maint to check SBL's t1-4000 "A " recv...//dg		6/10	0830
Maint advised there was a bad "A" recv card in the T1-4000 at SBL. Switched"A" recv back on line. System clear....//dg		6/10	0840
Problem isolated to bad recv card in T1-4000 at SBL.			
There wa s a distinct disadvantage in not being able to have both FER's of both recvs of the T1-4000 while in monitor immediate. Only the recv mux on line wa s updated.cs			
NOTE: ther were erroneous FER displays for the "B" mux, problem turned over to the soft ware personel..cs		6/10	0845
The problem with the erroneous FER displays on the "B" mux at SBL appears/appeared to be within the DATEC equipment....However, this clea red up before it could be isolated...The monitoring system now appears to be functioning properly..Will continue to monitor this to see if it appears again...///RR			

TECH CONTROLLER DBG

OBSERVED BY CMS

#1 10 June 77

```
MAC-3-Ø7-12                          SYSTEM OVERVIEW                 TIME  161/Ø733:49
              HUA         SBL
RADIO A        .           .
      B        .           .
MUX SW         .           .
     A         .           .
     B         .           .
CY1Ø4          .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
T1WB1          .           .
               .           .
               .           .
          ......................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .
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AS-2                                LINK STATUS                        TIME  161/Ø734:55
                            ......T1-4ØØM......                 ......RADIO......
                              HUA          SBL                     HUA         SBL
  ALARM      SW MAJOR                  .            TX PROB                .
             SW MINOR                  .            RX PROB                .
             MAJOR                     .                                   .
  STATUS     TX IN SVC         A       .     A      TX IN SVC        A     .     A
             RX IN SVC         A       .     A      RX IN SVC        A     .     A
             MAINT                     .            MAINT                  .
  PARAMETER  FER           <1.ØE-7    .<1.ØE-7      RX SQUELCH             .
             CRFRM                     .            RSL MARGIN    3Ø.333   . 37.5ØØ
                                                    EYE MARGIN    13.482   . 14.3ØØ
             BER COR       NO DATA    .NO DATA      EYE AMPL     -8.8Ø65   .-9.ØØØØ
                                                    EYE HITS         Ø.Ø   .    Ø.Ø
                                                    DER BER      1.4E-13   . 4.3E-14
                                                                           PAGE 1
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#2 10 June 77

```
IO-?05                               LINK STATUS                           TIME  161/0738:48
                              ......CY-104......                       ......TINBI......
                                  HUA         SBL                              HUA      SBL
  ALARM          SERVICE           .                     ?FICE                  .
                                   .                                            .
                                   .                                            .
                 REMOTE            .                                            .
                                   .                                            .
                                   .                                            .
  STATUS         MAINT             .                     MAINT                  .
                                   .                                            .
                                   .                                            .
  PARAMETER      CHANNEL           .                     FER   <1.ØE-6         .<1.ØE-6
                                   .                     REFRAME                .
                                   .
  SITE           ENTRY             .
  ALARMS         FIRE              .
                 AC PWR            .
                 BATTERY           .
                 W.A. PR           .
                 W.G. HV           .
                 FLOOD             .                                           PAGE 2
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MAC-1-Ø1-Ø6              LINK PERFORMANCE ASSESSMENT - RADIOS       TIME  161/Ø739:59
                LAST    LAST HR   LAST 24 HR          LAST 3Ø DAYS       LAST 3Ø MTHS
                SCAN     MEAN     MEAN      DEV       MEAN     DEV       MEAN     DEV
 HUA RSLMAR 3Ø.333   29.879   29.972   .48665   25.589   8.456Ø ---------------- DB
  A  EYEMAR 13.482   13.715   13.443   .22197   9.492Ø   4.ØØØ2 ---------------- DB
     RSLAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   .8749Ø ------------------------- RATE
     EYEAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   .8713Ø ------------------------- RATE
     EYEHIT    Ø.Ø      Ø.Ø      Ø.Ø      Ø.Ø   31.435   6Ø.488 ---------------- /SC
 HUA RSLMAR 27.516   27.3Ø6   27.285   1.321Ø   3Ø.241   2.Ø94Ø ---------------- DB
  B  EYEMAR 5.8569   6.225Ø   6.36Ø4   .75243   6.4459   2.5487 ---------------- DB
     RSLAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   .98842 ------------------------- RATE
     EYEAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   Ø.9983 ------------------------- RATE
     EYEHIT    Ø.Ø      Ø.Ø   .61455   2.1336   3.7895   4.5883 ---------------- /SC
 SBL RSLMAR 37.5ØØ   37.643   36.269   2.4525   39.Ø53   1.Ø347 ---------------- DB
  A  EYEMAR 14.3ØØ   14.Ø65   13.581   .45742   12.913   .6Ø52Ø ---------------- DB
     RSLAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   1.ØØØØ ------------------------- RATE
     EYEAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   Ø.9266 ------------------------- RATE
     EYEHIT    Ø.Ø      Ø.Ø   .ØØØ66   .ØØ211   2.8971   3.7459 ---------------- /SC
 SBL RSLMAR 32.333   32.483   32.22Ø   1.2777   34.472   .93899 ---------------- DB
  B  EYEMAR 13.831   13.831   13.46Ø   .49666   12.544   1.4944 ---------------- DB
     RSLAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   1.ØØØØ ------------------------- RATE
     EYEAVL 1.ØØØØ   1.ØØØØ   1.ØØØØ --------   Ø.9966 ------------------------- RATE
     EYEHIT    Ø.Ø      Ø.Ø   .ØØØ28   .ØØØ99   1.4962   3.1386 ---------------- /SC
PI   ..ØØØØ  1.ØØØØ   1.ØØØØ --------   1.ØØØØ ------------------------Ø11 1.ØØØØ  1
```

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```
                 LAST   LAST HR    LAST 24 HR         LAST 3Ø DAYS      LAST 3Ø MTHS
                 SCAN     MEAN    MEAN      DEV       MEAN     DEV      MEAN      DEV
 HUA EYEVOL-3.75ØØ -3.73ØØ -3.7398  .Ø793Ø -4.1448  .41897 ----------------- VLTS
  A  RXSQH     Ø.Ø      Ø.Ø      Ø.Ø -------- 6.ØØØØ ------------------------- RTE
 HUA EYEVOL-4.47ØØ -4.4325 -4.4147  .Ø9514 -4.3948  .23963 ----------------- VLTS
  B  RXSQH     Ø.Ø      Ø.Ø      Ø.Ø -------- 12.ØØØ ------------------------- RTE
 HUA LNKAVL 1.ØØØØ  1.ØØØØ  Ø.9964 -------- Ø.9992 ------------------------- RTE
 SBL EYEVOL-3.68ØØ -3.7ØØØ -3.6657  .37496 -3.7942  .Ø6527 ----------------- VLTS
  A  RXSQH     Ø.Ø      Ø.Ø      Ø.Ø -------- 13.ØØØ ------------------------- RTE
 SBL EYEVOL-3.72ØØ -3.72ØØ -3.7345  .1ØØ55 -3.831Ø  .14178 ----------------- VLTS
  B  RXSQH     Ø.Ø      Ø.Ø      Ø.Ø -------- 8.ØØØØ ------------------------- RTE
 SBL LNKAVL 1.ØØØØ  1.ØØØØ  1.ØØØØ -------- 1.ØØØØ ------------------------- RTE
N11     Ø.Ø     Ø.Ø      Ø.Ø -------- 13.ØØØ -----------------------PØ1SBLP11-3.7
```

```
                 LAST   LAST HR    LAST 24 HR         LAST 3Ø DAYS      LAST 3Ø MTHS
                 SCAN     MEAN    MEAN      DEV       MEAN     DEV      MEAN      DEV
 HUA FER    1.ØE-15 2.3E-16 2.4E-1Ø-------- 5.5E-8 ------------------------- RTE
  A  FERAVL 1.ØØØØ  1.ØØØØ  1.ØØØØ -------- 1.ØØØØ ------------------------- RTE
     CRFRM     Ø.Ø      Ø.Ø      Ø.Ø -------- 3.3333  2.6874 ----------------- RTE
     CR/SQH    Ø.Ø      Ø.Ø      Ø.Ø -------- 1.ØØØØ ------------------------- RTE
     CR/HIT    Ø.Ø      Ø.Ø      Ø.Ø -------- 2.ØØØØ ------------------------- RTE
 HUA FER    1.ØE-15 3.3E-17 1.4E-18-------- 1.4E-19------------------------- RTE
  B  FERAVL 1.ØØØØ  1.ØØØØ  1.ØØØØ -------- 1.ØØØØ ------------------------- RTE
     CRFRM     Ø.Ø      Ø.Ø  1.ØØØØ -------- 2.3333  2.6Ø87 ----------------- RTE
     CR/SQH    Ø.Ø      Ø.Ø      Ø.Ø -------- 1.ØØØØ ------------------------- RTE
     CR/HIT    Ø.Ø      Ø.Ø      Ø.Ø -------- 1.ØØØØ ------------------------- RTE
 SBL FER    1.ØE-15 2.3E-16 7.9E-6 -------- 4.ØE-7 ------------------------- RTE
  A  FERAVL 1.ØØØØ  1.ØØØØ  1.ØØØØ -------- 1.ØØØØ ------------------------- RTE
     CRFRM     Ø.Ø      Ø.Ø  1.ØØØØ -------- 1.6667  2.2111 ----------------- RTE
     CR/SQH    Ø.Ø      Ø.Ø      Ø.Ø -------- 4.ØØØØ ------------------------- RTE
     CR/HIT    Ø.Ø      Ø.Ø      Ø.Ø -------- 5.ØØØØ ------------------------- RTE
 SBL FER    5.2E-1Ø 6.ØE-9 ----------------- 1.3E-7 ------------------------- RTE
  B  FERAVL 1.ØØØØ  1.ØØØØ ----------------- 1.ØØØØ ------------------------- RTE
     CRFRM     Ø.Ø      Ø.Ø  1.ØØØØ -------- 1.1667  1.4625 ----------------- RTE
     CR/SQH    Ø.Ø      Ø.Ø      Ø.Ø -------- 3.ØØØØ ------------------------- RTE
     CR/HIT    Ø.Ø      Ø.Ø      Ø.Ø -------- 3.ØØØØ ------------------------- RTE
```

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MAC-1-Ø7-12 LINK PERFORMANCE ASSESSMENT - T1WB1 TIME 161/Ø744:1

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	FER	1.2E-14	3.2E-15	.ØØØ14	--------	1.4E-7	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	3.ØØØØ	--------	5.8333	4.1399	--------	--------	RTE
SBL	FER	1.2E-14	2.8E-15	.ØØØ19	--------	3.2E-6	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	1.ØØØØ	--------	3.3333	2.8674	--------	--------	RTE

AS-1 MAINTENANCE VOLTAGES - HUA TIME 161/Ø/45:Ø3

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.5	G	16.5	15.7	15.Ø	14.2	13.5	14.9	3.09	153/Ø9Ø7
Ø2	T1WB1+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	11.9	2.46	153/Ø9Ø7
Ø3	T14ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØ8	153/Ø9Ø7
Ø4	T14ØØØ-6	-6.08	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.08	Ø	153/Ø9Ø7
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.Ø29	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.ØØ6	153/Ø9Ø7

A52 @49HUADØ1Ø1DØ5T1WB1+15 D16 15.5D

2
4GD28 16.5 15.7 15.Ø 14.2 13

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.2	.Ø13	153/Ø911
Ø2	T1WB1+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	.Ø11	153/Ø911
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØØ	153/Ø911
Ø4	T14ØØØ-6	-6.Ø4	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø3	.ØØ5	153/Ø911
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.ØØ8	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	Ø	153/Ø911

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AS-1                                    SYSTEM OVERVIEW                   TIME  161/08Ø7:38
                 HUA          SBL
RADIO A           .            .
      B           .            .
MUX SW                         .
      A           .         >IA.
      B           .            .
CY1Ø4             .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
T1WB1             .            .
                  .            .
                  .            .
            .......................
TELEMETRY.        .            .
         .        .            .
SITE     .        .            .
```

```
MAC-1-Ø7-12                          LINK STATUS                          TIME  161/081Ø:34
                               ......T1-4ØØØ......                     .......RADIO.......
                                  HUA         SBL                         HUA         SBL
   ALARM        SW MAJOR                 .               TX PROB                 .
                SW MINOR                 .               RX PROB                 .
                MAJOR                    .                                       .
   STATUS       TX IN SVC          A     .     A         TX IN SVC         A     .     A
                RX IN SVC          A     .     A         RX IN SVC         A     .     A
                MAINT                    .               MAINT                   .
   PARAMETER    FER            <1.ØE-7   . 1.ØE-6 A      RX SQUELCH              .     *
                CRFRM                    .               RSL MARGIN    29.936    . 4Ø.556
                                                         EYE MARGIN    13.331    . 13.597
                BER COR        NO DATA   . 6.95Ø7 R      EYE AMPL     -3.8365    .-9.Ø[illegible]
                                                         EYE HITS         1.Ø    .    4.3
                                                         DER BER      8.4E-14    . 1.2E-13
                                                                               PAGE 1
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DØ1HUAD?yQ-ØØ8 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 161

			LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA		EYEVOL	-3.73ØØ	-3.73ØØ	-3.7381	.Ø7886	-4.1448	.41897	--------	--------	VLTS
	A	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	6.ØØØØ	--------	--------	--------	RTE
HUA		EYEVOL	-4.47ØØ	-4.47ØØ	-4.4129	.Ø9423	-4.3948	.23963	--------	--------	VLTS
	B	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	12.ØØØ	--------	--------	--------	RTE
HUA		LNKAVL	1.ØØØØ	1.ØØØØ	Ø.9965	--------	Ø.9992	--------	--------	--------	RTE
SBL		EYEVOL	-3.74ØØ	-3.74ØØ	-3.6649	.37485	-3.7942	.Ø6527	--------	--------	VLTS
	A	RXSQH	Ø.Ø	Ø.Ø	1.ØØØØ	--------	13.ØØØ	--------	--------	--------	RTE
SBL		EYEVOL	-3.77ØØ	-3.77ØØ	-3.7329	.1ØØ36	-3.831Ø	.14178	--------	--------	VLTS
	B	RXSQH	Ø.Ø	1.ØØØØ	Ø.Ø	--------	8.ØØØØ	--------	--------	--------	RTE
SBL		LNKAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE

MAC-3-16-17 LINK PERFORMANCE ASSESSMENT - T1-4ØØØ TIME 161/Ø837:32

			LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA		FER	1.ØE-15	6.7E-17	2.4E-1Ø	--------	5.5E-8	--------	--------	--------	RTE
	A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
		CRFRM	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.3333	2.6874	--------	--------	RTE
		CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	1.ØØØØ	--------	--------	--------	RTE
		CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	9.ØØØØ	--------	--------	--------	RTE
HUA		FER	1.ØE-15	3.3E-17	1.4E-18	--------	1.4E-19	--------	--------	--------	RTE
	B	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
		CRFRM	Ø.Ø	Ø.Ø	1.ØØØØ	--------	2.8333	2.6Ø87	--------	--------	RTE
		CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	1.ØØØØ	--------	--------	--------	RTE
		CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	1.ØØØØ	--------	--------	--------	RTE
SBL		FER	2.2E-6	7.3E-8	3.9E-6	--------	4.ØE-7	--------	--------	--------	RTE
	A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
		CRFRM	Ø.Ø	Ø.Ø	1.ØØØØ	--------	1.6667	2.2111	--------	--------	RTE
		CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	4.ØØØØ	--------	--------	--------	RTE
		CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	5.ØØØØ	--------	--------	--------	RTE
SBL		FER	5.2E-1Ø	6.ØE-9	--------	--------	1.3E-7	--------	--------	--------	RTE
	B	FERAVL	1.ØØØØ	1.ØØØØ	--------	--------	1.ØØØØ	--------	--------	--------	RTE
		CRFRM	Ø.Ø	Ø.Ø	1.ØØØØ	--------	1.1667	1.4625	--------	--------	RTE
		CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.ØØØØ	--------	--------	--------	RTE
		CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.ØØØØ	--------	--------	--------	RTE

During the scenarios a few omissions were noted of certain alarms/parameters which would have made the monitoring facility more complete or effective; these will be discussed. Also, in discussions with tech controllers during and following the scenario test phase, they expressed preferences regarding the parameters available for monitoring. Their remarks provided first hand user information giving insight into the completeness of the alarm/parameter list.

One of the Tech Controller comments arising from the System Simulation Scenarios dealt with the inclusion of local and remote alarm information in the CRT displays. This feature is presently included in the CY-104 alarms, i.e., Service and Remote. However, because of the way these two alarms are brought out of the CY-104, the effectiveness is negated. Both Service and Remote alarms originate via the operation of one relay, K1, within the Power and Alarm Unit of the CY-104. Therefore, if a local Service alarm has been generated, a Remote alarm is generated also. An outgoing alarm is transmitted to the far-end and results in a Service alarm at that site, and therefore, also a Remote alarm for the reason just given. The result, then, is that a local alarm at Ft. Huachuca, for example, will cause not only a Remote alarm at Site Sibyl, but a Service alarm at Sibyl and a Remote alarm at Ft. Huachuca as well. This shortcoming stems from the fact that the signal that drives the Remote Alarm Indicator on the Power and Alarm Unit of the CY-104 is inaccessible for DATEC monitoring because of TEMPEST restrictions. This aspect was discussed during the study phase for ATEC Digital Adaptation (Refer to Volume I of Final Report for ATEC Digital Adaptation Study - Report No. 476-13656).

For the Ft. Huachuca demonstration, only 6 maintenance voltages at each site were selected: two voltages from the "A" radio transceiver, two from the "A" T1-4000 multiplexer and two from the T1WB1. To provide complete monitoring, all secondary derived voltages should be monitored along with the prime dc voltage (-48V) to the communication system.

Present DATEC configuration provides for 7 site alarms:

Entry
Fire
AC Power
Battery
Waveguide Pressure
Waveguide Humidity
Flood

Since no sensors/transducers were available either at Ft. Huachuca or Site Sibyl, a switch was provided to simulate one of the site alarms-- again, just for demonstration purposes. These alarms can provide very useful information. Had there been sensors for two particular functions during field tests, they would have served to prevent undesirable situations and in one instance would

have called attention to an overheating condition, in the AN/FRC-162 Radio, which eventually led to burn-out and catastrophic damage to a power supply unit. The other alarm which would have been useful was the AC Power monitor. There were numerous momentary outages of primary ac power at both Ft. Huachuca and at Site Sibyl. Power supply circuits in the AN/FRC-162 Radio were such that secondary dc supplies did not fully recover following resumption of normal line voltage levels. They remained at about half their normal voltages, causing continued loss of service. Site alarms, then, are definitely needed. A survey of a particular site should be made, and once the elements to be monitored are chosen, the only remaining task is one of providing the necessary sensors and interface with DATEC equipment.

Another parameter should be considered for Trend Analysis (TA). There is presently no CY-104 alarm/parameter monitored and trended on a long-term basis which provides information relative to service history. The CY-104 Service Alarm could be used for this purpose in much the same manner as FER is used in the FER Available TA parameter. This would involve only software changes to incorporate.

The Tech Controllers were in general agreement that one parameter, BER Correlation, which is the difference between the log of T1-4000 FER and the log of BER derived from the baseband Eye by the BEM, provided no additional information which would be useful in fault recognition or isolation. They felt that FER and the Eye parameters such as Eye Margin, Derived BER and Hits, were sufficient relative to alarming and trending.

6.1.2 The Pate Software Adaptation Requirements Specified In Paragraphs 1.3 through 1.3.1.4 of Annex II of the S.O.W.

The following matrix in Table 6-3 shows each S.O.W. section number and description followed by the PATE files or new software modules that satisfies the requirement. Also shown is a description of the way that the test data validates the requirement. The appendices under Validation refer to appendices in the Field Test Plan and Procedures document, dated 24 March 1977. Module names and their place in the software hierarchy can be obtained from Figures 6-11 through 6-15 in Paragraph 6.2.1.

6.1.3 The Hardware Adaptation Requirements Specified in Paragraphs 1.2 through 1.2.2.9 of Annex II of the S.O.W.

Compliance with each of these requirements was verified during in-plant tests of the DATEC equipment. Although not specifically addressed in the Field Test Plan/Procedures, compliance with the above paragraphs of the S.O.W. is implicit in the usage and proper operation of the hardware adaptations throughout all phases of the field test program. The field tests, specifically the System Simulation Scenarios, provided assessment of the operational

TABLE 6-3. DATEC SOFTWARE S.O.W. COMPLIANCE MATRIX

S.O.W. Section No.	Description	Satisfied by Module(s)	Validation
1.3.1.1	Addition to PATE operator interaction	PATE File $SPCS	Presence of test data in Section II
1.3.1.2	Modify PATE DLC routines for MAC/ MAD communication	PATE File $SPNIS replaced by file $SDLC	Presence of test data in Section II
1.3.1.3	Addition of Nodal Control Monitoring task	1.0 - Task Name - NS	Presence of test data in Section II
1.3.1.3.1	Command Selection	1.1, 1.1.1 PATE IQCS Task	Observation of Scan Sequence during testing
1.3.1.3.2	Command Transmission and Reception	1.2.1, 1.3.1, 1.4.1, 1.4.2, 1.4.3, 4.11, 4.16	Presence of test data in Section II
1.3.1.3.3	Response Error checking	1.4.6, 4.9, 4.11	In-Plant Test H Field Test observation
1.3.1.3.4	Results Processing	1.4, 1.4.5, 1.5	See detail below
1.3.1.3.4 (a)	Process Major Alarm Scan Data	1.2	Validation Test Appendix A
1.3.1.3.4 (b)	Transfer and Alarm Summary Data to Site Data Base	1.3	Validation Test Appendix A
1.3.1.3.4 (c)	Calculate Site Parameters	1.5	See below
1.3.1.3.4 (cl)	RSL and RSL Availability	1.5.1	Validation Test Appendix B
1.3.1.3.4 (c2)	Tl-4000 Frame Errors	1.5.9	Validation Test Appendix E
1.3.1.3.4 (c3)	Tl-4000 Reframes	1.5.8	Validation Test Appendix E
1.3.1.3.4 (c4)	Eye Noise, Eye Amplitude, Eye Hits	1.5.2, 1.5.3, 1.5.4	Validation Test Appendix F

TABLE 6-3. DATEC SOFTWARE S.O.W. COMPLIANCE MATRIX (Cont)

S.O.W. Section No.	Description	Satisfied by Module(s)	Validation
1.3.1.3.4 (c5)	T1WB1 Frame Errors	1.5.6	Validation Test Appendix D
1.3.1.3.4 (c6)	T1WB1 Reframes	1.5.5	Validation Test Appendix D
1.3.1.3.4 (c7)	RSL/Noise Changed Link Availability	1.5.11	Validation Test Appendix G
1.3.1.3.4 (c8)	Reframes/Receiver to Squelch	1.5.7, 1.5.8	Validation Test Appendix G
1.3.1.3.4 (c9)	Reframes/Eye Hits	1.5.8	Validation Test Appendix G
1.3.1.3.4 (c10)	Error Rate Availability	1.5.9	Validation Test Appendix E
1.3.1.3.4 (c11)	Derived BER	1.5.2	Validation Test Appendix F
1.3.1.3.4 (d)	Determine BER	4.8, 4.8.1	Validation Tests B,C,D,E,F,G
1.3.1.3.4 (e)	Determine Parameter Statistics	4.8, 4.8.2, 4.8.3, 4.8.4, 4.8.5, 4.8.6, 4.8.7, 4.8.8, 4.8.9, 4.8.10	In-Plant Tests B,D,E,F,G Validation Tests B and D
1.3.1.3.5	Output Processing	1.6	See below
1.3.1.3.5 (a)	System Overview	1.6.1, 1.6.6	Validation Tests
1.3.1.3.5 (b)	Link Status - Page 1	1.6.2, 1.6.6	Validation Tests
1.3.1.3.5 (c)	Link Status - Page 2	1.6.3, 1.6.6	Validation Tests
1.3.1.3.5 (d)	Link PA - Page 1	1.6.4	Validation Tests
1.3.1.3.5 (e)	Link PA - Page 2	1.6.4	Validation Tests

TABLE 6-3. DATEC SOFTWARE S.O.W. COMPLIANCE MATRIX (Cont)

S.O.W. Section No.	Description	Satisfied by Module(s)	Validation
1.3.1.3.5 (f)	Link PA - Page 3	1.6.4	Validation Tests
1.3.1.3.5 (g)	Link PA - Page 4	1.6.4	Validation Tests
1.3.1.3.5 (h)	Maintenance Voltages	1.5.10, 1.6.5, 2.4, 2.5	Validation Tests
1.3.1.4	Nodal Control Operator Interaction	2.0	See below
1.3.1.4 (a)	Link Performance Assessment	2.1	Validation Tests and Scenarios NC, LP, 1, {1, 2, 3, 4} Command
1.3.1.4 (b)	Display Link Status	2.2	Validation Tests System Scenarios NC, LS, 1, {1, 2} Command
1.3.1.4 (c)	Display Site Parameters (Maintenance Voltages)	2.3	Validation Test C System Scenarios NC, MV {HUA, SBL} Command
1.3.1.4 (d)	Access Alarm Thresholds	2.13, 2.13.1, 2.13.2	Software Log 466 Pages 3,7,11,39, 40,41 NC,AC,SA {HUA, SBL} NC,AC,AT,N Commands

TABLE 6-3. DATEC SOFTWARE S.O.W. COMPLIANCE MATRIX (Cont)

S.O.W. Section No.	Description	Satisfied by Module(s)	Validation
1.3.1.4 (e)	Change Alarm Thresholds	2.14, 2.14.1, 2.14.2	Software Log 466 Pages 3,7,11,39, 40,41 Data entered with Change Commands NC,CH,SA $\begin{vmatrix}\text{HUA}\\ \text{SBL}\end{vmatrix}$ NC,CH,AT,N In-Plant Test Report Section III
1.3.1.4 (f)	Add to Alarm Library	2.14, 2.14.2	Software Log 466 Pages 3,7,11,39, 40,41 Data entered with Change Commands NC,CH,AT,N
1.3.1.4 (g)	Delete from Alarm Library	2.14, 2.14.2	See 1.3.1.4(f)
1.3.1.4 (h)	List Alarm Library	2.13, 2.13.2	Same as 1.3.1.4(f) NC,AC,AT,N Command
1.3.1.4 (i)	Tag Parameters for Statistics	1.14, 2.14.1	In-Plant Test Report Section III Presence of Trending Data in Section II
1.3.1.4 (j)	Reset Parameter Statistics	2.14, 2.14.4 Data Base Generator Program	In-Plant Test Report Section III Field Validation Tests required clearing before test
1.3.1.4 (k)	Return to Normal Nodal Control Scan	2.6	The use of NC,RN: NC,SN Commands

validity of the hardware adaptations; not only from the standpoint of correct or accurate operation, but also with respect to utility or effectiveness.

To best illustrate how the BEM and EPUT were used as effective tools in CPMAS operations, consider the following two test scenarios. The first is a scenario from Appendix R, 13 June 1977, wherein EYE parameters were caused to degrade as a result of abnormal RFI which was introduced at the in-service radio receiver waveguide. Note that the tech controller was able to identify the source of the problem through the use of EYE parameters, Margin and Hits, as processed by the BEM, before it had progressed to the point where BER was excessively degraded. (Derived BER was 1.0×10^{-7} and T1-4000 FER was still less than 10^{-7}.)

The second scenario (Appendix U', 20 June 1977), illustrating use of the EPUT, was one of many wherein EPUT processed data was utilized in problem identification and isolation. In this case T1-4000 frame errors counted by the EPUT (from which FER is computed by the PATE), and transient T1-4000 control reframes latched by the EPUT were used to pinpoint the fault to the "A" multiplexer.

As a result of observing the equipment in operation during test scenarios and from comments from the tech controllers, there was a hardware change made to the EPUT to increase its effectiveness. It was noted in such scenarios as that of Appendix K that occasionally, depending upon the point in the scan, a radio receiver squelch induced by momentarily closing a waveguide shutter would not be displayed following the succeeding scan. The time base (i.e., sample period) of the EPUT was two minutes. The normal scan period (i.e., time between CRT display updates) was between 3-1/2 and 4 minutes. It was therefore possible for the EPUT to latch a transient event, time-out in 2 minutes, and then clear itself by the time it was sampled again by the nodal controller. The occurrence of the transient event was therefore lost. An optimum time base to assure that no data is lost would be slightly less than the normal scan time. The time period chosen was 3-1/2 minutes. Field modification of the EPUT was a relatively simple matter of changing time base strapping on the Command printed circuit board assembly. This is documented in the Ft. Huachuca and Sibyl Hardware Log Books (Pages 2 and 1 respectively).

This modification, however, had its disadvantages too. It slowed down fault isolation. Increasing the time base from 2 minutes to 3-1/2 minutes slows down the process of determining what a frame error rate is, for instance. A dual time base-- 3-1/2 minutes during normal scan and a shorter period during fault isolation procedures-- was considered. This is covered in greater depth in Paragraph 6.1.15 of this section.

PROCEDURE	DATE	TIME
	6-13-77	

R1. At the HUA in-service receiver waveguide, using the HP 570-30 Directional Coupler and HP 620B SHF Signal Generator, apply the following frequencies (deviation from center received frequency) at the levels and for the period of time indicated:

Frequency (Rec'd Freq.)	Level	Time
	-60, -50, -40, -30 dBm0	5 MIN
+ 3.15 MHz	~~-20~~, -30 & -40dBm0	~~TBD~~
- 3.15 MHz	-20, ~~-30~~ & -40dBm0	"
+ 6.3 MHz	-20, ~~-30~~ & -40dBm0	"
- 6.3 MHz	-20, -30 & -40dBm0	"

DATE	TIME
-60dBm	0920
-55	0925
-50	0930
-45	0934
-43	0940
-40	0945

R2. At the completion of step R1, restore equipment to baseline configuration.

R3. At HUA, using an HP 606B (or equivalent) test oscillator and the summing amp (a special piece of test equipment) configured as shown in Figure R-1, apply the following frequencies at the levels and for the period of time indicated:

Frequency	Level	Time
1.544MHz	-20 and -30dBm0	TBD
3.088MHz	-20 and -30dBm0	"
6.176MHz	-20 and -30dBm0	"
12.352MHz	-20 and -30dBm0	"

R4. At the completion of step R3, restore equipment to baseline configuration.

CONDUCTED BY C L Christner 6-13-77

OBSERVED BY ____________________

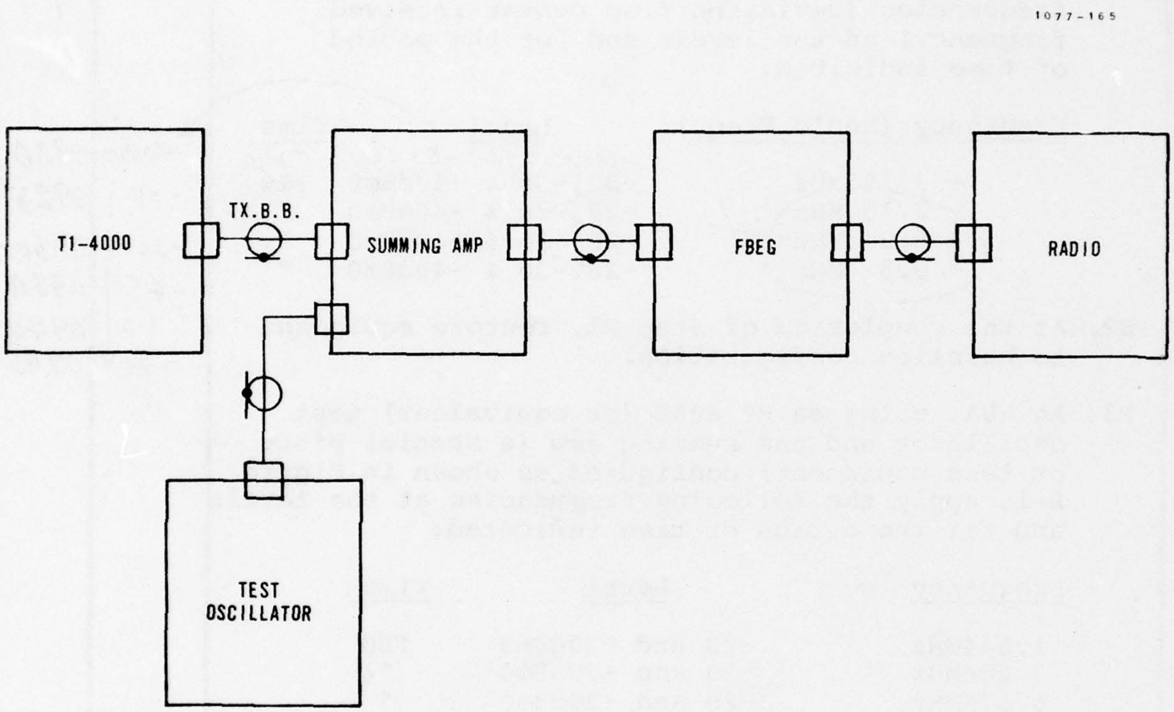

Figure R-1. Test Configuration, RFI at Baseband Level

DATEC SYSTEM EVALUATION WORKSHEET 13 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with all systems green, and systems da ta attached...////RR	1-4/13 June 77	6/13	0750
Noticed audible alarm (radio), and system switched to "B" recvr here a t HUA...A lso a re on "B" a t SBL...investigating furter ATT..///RR			0851
Back on "A" systems both at HUA & SBL...CRT overview display now indicates the "B" Recvr as amber at HUA...Checking ATT...////RR			0906
LP display, Pg 1 indicates that the "B" Recv RSL marging at a -9..Chking ATT...///RR			0908
Requested maint at HUA check the B" recvr (Front end)...////RR			0910
Systems green again. Maint a dvsd they had a cable off the "B" recvr....////RR.///This was a CWC type problem...///RR			0914
Link Status display shows low eye margin on HUA rec, Parameter table shows rapid drop in eye margin...Tblshg to locate/isolate pblm.../ph	5/13 June 1977		0940
Requested maint to swap to "b" rcvr at HUA. .../ph			0943
Swap ba ck to "A" recv at HUA..//cs			0950
Request maint switch SBL's Tx from "A" to "B" Tx./cs			0952
Suspected rfi on rec from SBL, Maint checking../ph			0959
SBL ha s new XMTR up for testing requested that they s hut down XMTR to see if it is causing RFI ../ph			1002
SBL shut down test XMTR, eye margin data, returned to normal...pblm logged as RFI caused by test XMTR at SBL..../ph			1006
All systems clear at this time.../ph			1010
SBL changed back to their "A" transmitter.../ph			1014
Trouble caused by a Test XMTR at SBL Site, causing RFI on HUA Rec...			

TECH CONTROLLER CMS

OBSERVED BY [illegible]

#1 13 June 77

```
MAC-1-Ø7-12                                   SYSTEM OVERVIEW                  TIME  164/1750:
                  HUA        SBL
RADIO A            .          .
      B            .          .
ML  SW             .          .
     A             .          .
     B             .          .
CY1Ø4              .          .
                   .          .
                   .          .
                   .          .
                   .          .
                   .          .
                   .          .
                   .          .
                   .          .
TIWB1              .          .
                   .          .
                   .          .
                   .          .
          ..........................
TELEMETRY.         .          .
         .         .          .
SITE     .         .          .

AS 2                                     LINK STATUS                      TIME  164/Ø/53:1Ø
                                   ......T1-4ØØØ......                    ......RADIO......
                                     HUA          SBL                       HUA         SBL
  ALARM         SW MAJOR                   .              TX PROB                .
                SW MINOR                   .              RX PROB                .
                MAJOR                      .                                     .
  STATUS        TX IN SVC            A     .     A        TX IN SVC    A         .     A
                RX IN SVC            A     .     A        RX IN SVC    A         .     A
                MAINT                      .              MAINT                  .
  PARAMETER     FER             <1.ØE-7   .<1.ØE-7        RX SQUELCH             .
                CRFRM                      .              RSL MARGIN   3Ø.111    . 39.375
                                                          EYE MARGIN   13.369    . 13.331
                BER COR         NO DATA   .NO DATA        EYE AMPL    -8.8365    .-8.9677
                                                          EYE HITS       Ø.Ø     .   Ø.Ø
                                                          DER BER      1.6E-13   . 8.4E-14
                                                                                 PAGE 1
```

#2 13 June 77

IQ-006 LINK STATUS TIME 164/0753:49

		......CY-104...... HUA	SBL		......TIWBI...... HUA	SBL
ALARM	SERVICE	.		OFFICE	.	
		.			.	
		.			.	
	REMOTE	.			.	
		.			.	
		.			.	
STATUS	MAINT	.		MAINT	.	
		.			.	
		.			.	
PARAMETER	CHANNEL	.		FER	<1.0E-6	.<1.0E-6
		.		REFRAME	.	
		.				
SITE	ENTRY	.				
ALARMS	FIRE	.				
	AC PWR	.				
	BATTERY	.				
	W.A. PR	.				
	W.G. HV	.				
	FLOOD	.				

PAGE 2

MAC-1-07-12 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 164/0754:49

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	30.111	30.195	30.283	.61913	27.134	7.2426	--------	--------	DB
A	EYEMAR	13.369	13.369	13.314	.14364	10.638	3.6644	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.92543	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	.91882	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	21.872	51.255	--------	--------	/SC
HUA	RSLMAR	32.018	31.962	31.226	.70834	30.131	2.0384	--------	--------	DB
B	EYEMAR	11.562	11.739	11.616	.32999	7.4473	2.8355	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.99308	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9961	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	3.7335	4.6243	--------	--------	/SC
SBL	RSLMAR	39.375	38.822	36.908	1.2799	35.230	1.4460	--------	--------	DB
A	EYEMAR	13.831	13.685	13.437	.28421	13.113	.57164	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9980	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00100	.00480	1.9380	3.3159	--------	--------	/SC
SBL	RSLMAR	34.600	33.640	32.051	.92883	33.673	1.3611	--------	--------	DB
B	EYEMAR	13.714	13.948	13.369	.19941	12.819	1.2813	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9980	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	.93943	2.6463	--------	--------	/SC
K11	1.0000	1.0000	1.0000	--------	.99308	--------	--------	--------	L11	

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#3 13 June 77

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 161/0[illegible]3:36

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	EYEVOL	-3.7600	-3.7600	-3.7649	.01256	-4.0335	.37962	--------	--------	VLTS
	RXSQH	0.0	0.0	0.0	--------	7.0000	--------	--------	--------	RTE
HUA	EYEVOL	-3.9200	-3.9044	-3.8973	.02956	-4.3996	.25981	--------	--------	VLTS
B	RXSQH	0.0	0.0	0.0	--------	12.000	--------	--------	--------	RTE
HUA	LNKAVL	1.0000	1.0000	1.0000	--------	0.9986	--------	--------	--------	RTE
SBL	EYEVOL	-3.7200	-3.7325	-3.7570	.02482	-3.7640	.01216	--------	--------	VLTS
A	RXSQH	0.0	0.0	0.0	--------	14.000	--------	--------	--------	RTE
SBL	EYEVOL	-3.7300	-3.7100	-3.7601	.01737	-3.8024	.12298	--------	--------	VLTS
B	RXSQH	0.0	0.0	0.0	--------	9.0000	--------	--------	--------	RTE
SBL	LNKAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE

IQ-008 LINK PERFORMANCE ASSESSMENT - TI-4000 TIME 164/0[illegible]:40

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3 DAYS MEAN	LAST 3 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.0E-15	3.0E-16	4.2E-16	--------	5.5E-8	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	2.5555	2.5868	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	1.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	2.0000	--------	--------	--------	RTE
HUA	FER	1.0E-15	3.3E-17	1.4E-18	--------	1.2E-19	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	1.[illegible]	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	2.2222	2.3465	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	1.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	1.0000	--------	--------	--------	RTE
SBL	FER	1.0E-15	2.7E-16	4.2E-16	--------	5.3E-7	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	1.7778	2.1299	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	4.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	5.0000	--------	--------	--------	RTE
S	FER	5.2E-10	5.2E-11	2.2E-12	--------	1.3E-7	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	1.5556	2.4462	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE

#4 13 June 77

MAS LINK PERFORMANCE [illegible] - [illegible] [illegible]ME 164/[illegible]:51

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST [illegible] DAYS MEAN	LAST [illegible] DAYS DEV	LAST 3[illegible] MTHS MEAN	LAST 3[illegible] MTHS DEV	
HUA	FER	1.2E-14	4.ØE-15	5.1E-15	--------	4.[illegible]-6	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	Ø.Ø	--------	5.[illegible]	3.9441	--------	--------	RTE
SBL	FER	1.2E-14	3.6E-15	5.1E-15	--------	1.[illegible]-5	--------	--------	--------	RTE
	RFRM	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.4444	3.4096	--------	--------	RTE

IO-ØØ5 MAINTENANCE VOLTAGES - HUA TIME 164/[illegible]

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.5	G	16.5	15.7	15.Ø	14.2	13.5	15.5	.Ø4Ø	153/Ø2Ø7
Ø2	TIWBI+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.4	.ØØ7	153/Ø2Ø7
Ø3	TI4ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØ3	153/Ø2Ø7
Ø4	TI4ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø8	.ØØ9	153/Ø2Ø7
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.315	153/Ø2Ø7
Ø6	RADIO-24	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.Ø14	153/Ø2Ø7

MAS MAINTENANCE VOLTAGES - SBL TIME 164/Ø8Ø2:51

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.2	.ØØ9	153/Ø211
Ø2	TIWBI+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	Ø	153/Ø211
Ø3	TI4ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø211
Ø4	TI4ØØØ-6	-6.Ø5	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	.ØØ4	153/Ø211
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.Ø12	153/Ø211
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	2.4E	153/Ø211

5/13 Jun 77

```
! NC,AC,SS,HUA
PARAMETER ?9
TI   PERIOD ?H
01    3.4940      17   OMIT           33  OMIT
02     11.341     18   OMIT           34  OMIT
03     13.255     19   OMIT
04   OMIT         20   OMIT
05   OMIT         21   OMIT
06   OMIT         22   OMIT
07   OMIT         23   OMIT
08   OMIT         24   OMIT
09   OMIT         25   OMIT
10   OMIT         26   OMIT
11   OMIT         27   OMIT
12   OMIT         28   OMIT
13   OMIT         29   OMIT
14   OMIT         30   OMIT
15   OMIT         31   OMIT
16   OMIT         32   OMIT
TIME PERIOD ?
```

```
MAC-1-08-10                          LINK STATUS                       TIME  164/0941:15
                                ......T1-4000......                    ......RADIO......
                                 HUA             SBL                     HUA         SBL
   ALARM       SW MAJOR                   .              TX PROB                 .
               SW MINOR                   .              RX PROB                 .
               MAJOR                      .                                      .
   STATUS      TX IN SVC          A       .       A      TX IN SVC       A       .     A
               RX IN SVC          A       .       A      RX IN SVC       A       .     A
               MAINT                      .              MAINT                   .
   PARAMETER   FER             <1.0E-7    .<1.0E-7       RX SQUELCH              .
               CRFRM                      .              RSL MARGIN    30.889    . 36.400
                                                         EYE MARGIN    2.0494    . 13.831
               BER COR         NO DATA    .NO DATA       EYE AMPL     -8.8065    .-8.9355
                                                         EYE HITS         0.0    .    0.0
                                                         DER BER       2.2E-8    . 8.4E-14
                                                                              PAGE 1
```

```
MAC-1-08-10                          LINK STATUS                       TIME  164/0942:48
                                ......T1-4000......                    ......RADIO......
                                 HUA             SBL                     HUA         SBL
   ALARM       SW MAJOR                   .              TX PROB                 .
               SW MINOR                   .              RX PROB                 .
               MAJOR                      .                                      .
   STATUS      TX IN SVC          A       .       A      TX IN SVC       A       .     A
               RX IN SVC          A       .       A      RX IN SVC       A       .     A
               MAINT                      .              MAINT                   .
   PARAMETER   FER             <1.0E-7    .<1.0E-7       RX SQUELCH              .
               CRFRM                      .              RSL MARGIN    30.889    . 36.400
                                                         EYE MARGIN    .49993    . 13.831
               BER COR         NO DATA    .NO DATA       EYE AMPL     -8.8065    .-8.9355
                                                         EYE HITS      1.1211 A.      0.0
[illegible]
```

PROCEDURE	DATE	TIME
U1. Install the Frame Bit Error Generator (FBEG) between the radio and TI-4000 in the RX baseband input line at ~~SBL~~ HUA.	6-20-77	0800
U2. With the [illegible] switch of the FBEG set to NARROW, [illegible] depress the pushbutton switch several times (3-5). Repeat this operation at a rate of approxiamtely once every 5 minutes. Record the time when each operation is performed.		
Perturbation No. 1		0840
" " 2		0843
" " 3		0846
" " 4		0850
Requested to switch to B MUX @ 0851 — " " 5		
" " 6		
" " 7		
" " 8		
" " 9		
" " 10		
U3. When test is completed, restore equipment to baseline configuration.		

CONDUCTED BY C. L. Christner 6-20-77

OBSERVED BY ______________

DATEC SYSTEM EVALUATION WORKSHEET 20 June 77 Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with systems green, and data a ttached..////RR	~~1~~ 1-4/20 June 77	6/20	0845
Overview display indicates the "A " mux a t HUA is amber...Letting another scan go thru before doing anything...////RR	5/20 June 77		0846
Link status display indicates the problem with the "A" mux is FER....Req uested maint switch HUA to the "B" recv mux..///RR	6/20 June 77		0850
On "B" mux, recv at HUA, and display indicates this is also ba d.....However, this could be old data so have to wait for another sca n before we can decide if there is any problem with the "B" mux....///RR	7/20 June 77		0857
"B" mux has now cleared, and service appearrs to be restored....Advised maint to check the "A" mux, Recv at HUA.....////RR	8/20 June 77		0900
Problem isolated to bad Recv "A " mux at HUA.. maint advsd problem with the "Recv time base"... System back on the "A " mux ATT...///RR			0913
Displays used..... 1. System overview 2. Link status Pg # 1 . Note: The length of time required to determine if the "B" mux was good (after putting it on line) was lengthy, due to the scanning sequence/time...////RR			
TECH CONTROLLER R OBSERVED BY CMS			

SYSTEM OVERVIEW

200830 June 1977

```
            HUA        SBL
RA  ) A      .          .
      B      .          .
MUX SW       .          .
      A      .          .
      B      .          .
CY104        .          .
             .          .
             .          .
             .          .
             .          .
             .          .
             .          .
T1WB1        .          .
             .          .
             .          .
          .....................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .
```

Page 1 / 20 June 77

```
MAS                              LINK STATUS                      TIME  171/0830:58
                             ......T1-4000......              ......RADIO......
                                HUA        SBL                  HUA       SBL
  ALARM       SW MAJOR                .             TX PROB              .
              SW MINOR                .             RX PROB              .
              MAJOR                   .                                  .
  STATUS      TX IN SVC         A     .     A       TX IN SVC     A      .    A
              RX IN SVC         A     .     A       RX IN SVC     A      .    A
              MAINT                   .             MAINT                .
  PARAMETER   FER           <1.0E-7  .<1.0E-7       RX SQUELCH           .
              CRFRM                   .             RSL MARGIN  33.405   . 38.200
                                                    EYE MARGIN  13.255   . 13.142
              BER COR       NO DATA  .NO DATA       EYE AMPL   -8.8065   .-8.9677
                                                    EYE HITS      0.0    .   0.0
                                                    DER BER    1.9E-13   . 2.2E-13
                                                                         PAGE 1
```

AS-2		LINK STATUS			TIME 171/Ø831:45	
		......CY-1Ø4......			......T1WB1......	
		HUA	SBL		HUA	SBL
ALARM	SERVICE	.		OFFICE	.	
	REMOTE	.			.	
STATUS	MAINT	.		MAINT	.	
PARAMETER	CHANNEL	.		FER	<1.ØE-6	.<1.ØE-6
				REFRAME	.	
SITE ALARMS	ENTRY	.				
	FIRE	.				
	AC PWR	.				
	BATTERY	.				
	W.A. PR	.				
	W.G. HV	.				
	FLOOD	.				

PAGE 2

2/20 June 77

MAC-1-Ø7-12		LINK PERFORMANCE ASSESSMENT - RADIOS						TIME 171/Ø833:Ø7		
		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA A	RSLMAR	33.4Ø5	33.256	36.44Ø	Ø.Ø	26.777	11.1Ø9	--------	--------	DB
	EYEMAR	13.255	13.312	.8214Ø	Ø.Ø	11.226	2.963Ø	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.95173	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	.66667	--------	.94581	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	13.514	39.726	--------	--------	/SC
HUA B	RSLMAR	31.597	31.956	33.898	Ø.Ø	27.341	9.5415	--------	--------	DB
	EYEMAR	6.4465	6.4248	9.6676	Ø.Ø	7.3166	2.6224	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.99139	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9945	--------	--------	--------	RATE
	EYEHIT	.Ø1191	.Ø1191	.29778	Ø.Ø	3.Ø437	5.4656	--------	--------	/SC
SBL A	RSLMAR	38.ØØØ	38.767	39.877	Ø.Ø	37.772	2.3974	--------	--------	DB
	EYEMAR	13.142	12.857	11.805	Ø.Ø	12.695	2.3493	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93386	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9962	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	2.1319	3.5172	--------	--------	/SC
SBL	RSLMAR	36.889	37.111	36.667	Ø.Ø	33.542	2.5534	--------	--------	DB
	EYEMAR	13.Ø28	13.Ø28	12.971	Ø.Ø	13.293	1.1820	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93386	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9987	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.436ØØ	Ø.Ø	.53641	2.Ø368	--------	--------	/SC

MAS LINK PERFORMANCE ASSESSMENT - RADIOS TIME 171/Ø334:44

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	EYEVOL	-3.77ØØ	-3.765Ø	-5.4767	Ø.Ø	-3.9Ø24	.34784	--------	--------	VLTS
A	RXSQH	Ø.Ø	Ø.Ø	1.ØØØØ	--------	29.ØØØ	--------	--------	--------	RTE
HUA	EYEVOL	-4.41ØØ	-4.4Ø5Ø	-4.1Ø5Ø	Ø.Ø	-4.27Ø2	.247Ø2	--------	--------	VLTS
B	RXSQH	Ø.Ø	Ø.Ø	1.ØØØØ	--------	39.ØØØ	--------	--------	--------	RTE
HUA	LNKAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.99115	--------	--------	--------	RTE
SBL	EYEVOL	-3.78ØØ	-3.8Ø5Ø	-3.9ØØØ	Ø.Ø	-3.7337	.435Ø2	--------	--------	VLTS
A	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	2Ø.ØØØ	--------	--------	--------	RTE
SBL	EYEVOL	-3.79ØØ	-3.7ØØØ	-3.795Ø	Ø.Ø	-3.6915	.213Ø1	--------	--------	VLTS
B	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	15.ØØØ	--------	--------	--------	RTE
SBL	LNKAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9993	--------	--------	--------	RTE

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IQ-ØØ5 LINK PERFORMANCE ASSESSMENT - T1-4ØØØ TIME 171/Ø835:13

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	FER	5.7E-16	3.3E-17	2.4E-1Ø	--------	5.5E-8	--------	--------	--------	RTE
A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	2.ØØØØ	2.ØØØØ	--------	3.875Ø	4.47Ø4	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	1.ØØØØ	--------	22.ØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	18.ØØØ	--------	--------	--------	RTE
HUA	FER	5.7E-16	6.7E-17	8.3E-18	--------	4.2E-19	--------	--------	--------	RTE
B	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	1.ØØØØ	2.ØØØØ	--------	3.375Ø	3.9Ø31	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	1.ØØØØ	--------	18.ØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	9.ØØØØ	--------	--------	--------	RTE
SBL	FER	5.7E-16	6.7E-17	9.7E-18	--------	8.5E-7	--------	--------	--------	RTE
A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	1.ØØØØ	Ø.Ø	--------	1.6875	2.113Ø	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	7.ØØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	5.ØØØØ	--------	--------	--------	RTE
SBL	FER	3.ØE-1Ø	1.7E-11	1.3E-11	--------	1.3E-7	--------	--------	--------	RTE
B	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	1.ØØØØ	Ø.Ø	--------	1.5ØØØ	1.87Ø8	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	6.ØØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.ØØØØ	--------	--------	--------	RTE

MAS LINK PERFORMANCE ASSESSMENT - [illegible] TIME 171/Ø336:[illegible]

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 3[illegible] MEAN	LAST 3[illegible] DEV	
HL	FER	6.9E-15	8.ØE-16	1.5E-[illegible]	--------	1.1[illegible]-6	--------	--------	--------	RTE
	RFRM	4.Ø	2.ØØØØ	2.ØØØØ	--------	[illegible].125[illegible]	5.9674	--------	--------	RTE
SBL	FER	6.9E-15	8.ØE-16	1.2E-16	--------	1.5[illegible]	--------	--------	--------	RTE
	RFRM	Ø.Ø	1.ØØØØ	Ø.Ø	--------	3.1[illegible]	[illegible].3395	--------	--------	RTE

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AS-2 MAINTENANCE VOLTAGES - HL TIME 171/Ø336:59

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	15.6	Ø	153/Ø9Ø7
Ø2	T1WB1+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.4	Ø	153/Ø9Ø7
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.96	Ø	153/Ø9Ø7
Ø4	T14ØØØ-6	-6.Ø3	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø3	Ø	153/Ø9Ø7
Ø5	RADIO+24	23.9	G	26.4	25.2	24.Ø	22.8	21.6	23.9	Ø	153/Ø9Ø7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	Ø	153/Ø9Ø7

IQ-ØØ6 MAINTENANCE VOLTAGES - SBL TIME 171/Ø337:45

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.1	G	16.5	15.7	15.Ø	14.2	13.5	15.1	Ø	153/Ø911
Ø2	T1WB1+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	Ø	153/Ø911
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø911
Ø4	T14ØØØ-6	-6.Ø5	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø5	Ø	153/Ø911
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	24.Ø	Ø	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	Ø	153/Ø911

#5
20 June 77

```
AS-2                                  SYSTEM OVERVIEW                 TIME  171/Ø343:14
               HUA        SBL
RADIO A         .          .
      B         .          .
MUX SW          .          .
     A          .AI<       .
     B          .          .
CY1Ø4           .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
TIWB1           .AJI<      .
                .          .
                .          .
          ......................
TELEMETRY.           .          .
         .           .          .
SITE     .           .          .
```

```
AS-2                                  SYSTEM OVERVIEW                 TIME  171/Ø346:1[illegible]
               HUA        SBL
RADIO A         .          .
      B         .          .
MUX SW          .          .
     A          .AI<       .
     B          .          .
CY1Ø4           .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
TIWB1           .          .
                .          .
                .          .
          ......................
TELEMETRY.           .          .
         .           .          .
SI       .           .          .
```

#6 20 June 77

```
IQ-008                              LINK STATUS                          TIME  171/[illegible]7:[illegible]1
                             ......T1-4000......                         .......RADIO.......
                               HUA            SBL                          HUA          SBL
 ALARM        SW MAJOR                  .             TX PROB                    .
              SW MINOR                  .             RX PROB                    .
              MAJOR                     .                                        .
 STATUS       TX IN SVC        A        .       A     TX IN SVC        A         .     A
              RX IN SVC        A        .       A     RX IN SVC        A         .     A
              MAINT                     .             MAINT                      .
 PARAMETER    FER             1.2E-6 R.<1.0E-7        RX SQUELCH                 .
              CRFRM            *        .             RSL MARGIN    33.405       . 37.[illegible]
                                                      EYE MARGIN    13.142       . 12.[illegible]14
              BER COR         6.7436 R.NO DATA        EYE AMPL     -8.8307       .-8.[illegible]77
                                                      EYE HITS         0.0       .     [illegible].0
                                                      DER BER      2.2E-13       . 3.[illegible]E-13
                                                                              PAGE 1
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```
IQ-005                                SYSTEM OVERVIEW                TIME  171/[illegible]2:[illegible]7
               HUA            SBL
RADIO A         .              .
      B         .              .
MUX SW          .R<>           .
     A          .AS<           .
     B          .              .
CY104           .              .
                .              .
                .              .
                .              .
                .              .
                .              .
                .              .
T1W31           .              .
                .              .
                .              .
          .........................
TELEMETRY.            .            .
         .            .            .
SITE     .            .            .
```

#7 2Ø June 77

```
MAC-3-Ø1-Ø6                                SYSTEM OVERVIEW                    TIME  171/Ø854:58
                HUA           SBL
RADIO A          .             .
      B          .             .
MUX SW           .R<>          .
     A           .AS<          .
     B           .AI<          .
CY1Ø4            .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
TWB1             .AØ1<         .
                 .             .
                 .             .
            .......................
TELEMETRY.             .           .
          .            .
SITE      .            .           .
```

```
AS-2                                 LINK STATUS                       TIME  171/Ø857:51
                              ......TI-1ØØØ......                ......RADIO......
                               HUA          SBL                    HUA          SBL
   ALARM        SW MAJOR                .            TX PROB                .
                SW MINOR        *       .            RX PROB                .
                MAJOR                   .                                   .
   STATUS       TX IN SVC       A       .     A      TX IN SVC       A      .      A
                RX IN SVC       B       .     A      RX IN SVC       A      .      A
                MAINT                   .            MAINT                  .
   PARAMETER    FER          9.7E-6 R.<1.ØE-7        RX SQUELCH             .
                CRFRM           *       .            RSL MARGIN   33.524    . 38.2ØØ
                                                     EYE MARGIN   13.369    . 12.687
                BER COR      7.7918 R.NO DATA        EYE AMPL    -8.8Ø65    .-8.9677
                                                     EYE HITS        Ø.Ø    .    Ø.Ø
                                                     DER BER     1.6E-13    . 4.ØE-13
                                                                         PAGE 1
```

#8 2ϕ June 77

AS-2 — LINK STATUS — TIME 171/0359:20

		......T1-4000......			......RADIO......		
		HUA	SBL		HUA		SBL
ARM	SW MAJOR		.	TX PROB		.	
	SW MINOR	*	.	RX PROB		.	
	MAJOR		.			.	
STATUS	TX IN SVC	A	. A	TX IN SVC	A	.	A
	RX IN SVC	B	. A	RX IN SVC	A	.	A
	MAINT		.	MAINT		.	
PARAMETER	FER	<1.ØE-7	.<1.ØE-7	RX SQUELCH		.	
	CRFRM		.	RSL MARGIN	33.524	.	38.200
				EYE MARGIN	13.362	.	12.687
	BER COR	NO DATA	.NO DATA	EYE AMPL	-8.8065	.	-8.9677
				EYE HITS	0.0	.	0.0
				OPR BER	1.6E-13	.	4.0E-13

PAGE 1

MAS — SYSTEM OVERVIEW — TIME 171/0359:10

	HUA	SBL
RADIO A	.	.
B	.	.
MUX SW	.R<>	.
A	.AS<	.
B	.	.
CY104	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
TINB1	.	.
	.	.
	.	.

....

TELEMETRY. . .

: : :

ST . . .

There were also hardware changes made to the BEM Active Coupler (BAC) and to the BEM itself during the field test phase. The gain of the BAC was originally designed to accommodate a baseband composite RMS level of -7 dBm (determined during an early site survey) so as to provide a nominal 0.309 volt RMS to the BEM input circuits. A 100 ohm potentiometer was used to adjust for slight variations around the -7 dBm level. When the field tests began, however, it was noted that the baseband level was set in the receiver to -9 dBm. The 100 ohm potentiometer was, therefore, changed to 500 ohms to provide a wider range of gain adjust.

Further changes were made to the BAC and to the BEM to assure compatibility of the BEM with the DR8A baseband monitor point. Following are those changes and the reasons for them:

Unit	Change	Reason
BAC	Input resistance from 75 ohms to 560 ohms	Obtain the correct input voltage level to the BAC amplifier.
BEM	Xtal frequency in Receive Input Unit from 12.5533 MHz to 6.2765 MHz; tuning coil from 7 - 14 μH to 14 - 28 μH	Input to BEM is either the in-phase or quadrature signal from DR8A which is 6.3 MHz
BEM	Output filter added to Dispersion Voltage output to MAC	Smooth out (average) dispersion voltage changes due to PLL lock-up state changes in demodulator of DR8A
BEM	Voltage divider which sets threshold window for Hits changed to effectively narrow the window.	To maintain the same relative Hit count under similar RSL conditions. Since system had higher BER with DR8A and also more hits, the Hit window was narrowed such that amber and red thresholds related to nominal DR8A operation as they did for nominal AN/FRC-162 operation.

As a supplement to the Validation tests and System Simulation Scenarios which were conducted during field tests, additional data was collected to show correlation of BEM derived bit error rate (BER) with that measured using a BER tester. This was done when the AN/FRC-162 radio was being used and again later when the DR8A radio was in service. This data, shown in Tables 6-4 and 6-5 indicates correlation well within one order of magnitude which was the design goal for the BEM. Table 6-6 presents data that was taken during in-plant tests of the BEM, and is included here to show correlation down to a BER in the order of 10^{-9}.

TABLE 6-4. BEM DER BER VERSUS MEASURED BER, AN/FRC-162

DER BER	BER (Meas)	RSL (dBm, Ref)
7.3×10^{-13}	$<10^{-8}$	-37
1.7×10^{-12}	$<10^{-8}$	-46
2.0×10^{-12}	$<10^{-8}$	-57
1.4×10^{-11}	$<10^{-8}$	-62
9.3×10^{-10}	$<10^{-8}$	-68
2.1×10^{-9}	$<10^{-8}$	-70
2.6×10^{-7}	9.0×10^{-8}	-72
1.3×10^{-6}	3.0×10^{-6}	-73
3.9×10^{-5}	2.7×10^{-5}	-74
2.0×10^{-4}	1.3×10^{-4}	-75
4.9×10^{-4}	5.3×10^{-4}	-76
9.4×10^{-4}	1.6×10^{-3}	-77

TABLE 6-5. BEM DER BER VERSUS MEASURED BER, DR8A

DER BER	BER (Meas)	RSL (dBm, Ref)
3.1×10^{-10}	$<10^{-8}$	-75
1.4×10^{-9}	$<10^{-8}$	-80
2.8×10^{-9}	$<10^{-8}$	-82
6.9×10^{-9}	3.0×10^{-8}	-84
1.3×10^{-8}	4.0×10^{-8}	-85
3.0×10^{-8}	6.0×10^{-8}	-86
4.0×10^{-8}	1.2×10^{-7}	-87
1.9×10^{-7}	4.6×10^{-7}	-88
7.4×10^{-7}	1.3×10^{-6}	-89
5.0×10^{-6}	5.0×10^{-6}	-90
5.4×10^{-6}	1.3×10^{-5}	-91
2.7×10^{-4}	4.5×10^{-5}	-92
9.6×10^{-4}	2.0×10^{-4}	-93

TABLE 6-6. BEM DER BER VERSUS MEASURED BER, LABORATORY

DER BER	BER (Meas)
7.8×10^{-11}	7.5×10^{-10}
2.0×10^{-10}	6.1×10^{-10}
7.8×10^{-9}	8.0×10^{-9}
1.3×10^{-7}	6.6×10^{-8}
6.6×10^{-6}	5.1×10^{-6}
4.3×10^{-5}	3.8×10^{-5}
5.7×10^{-4}	5.3×10^{-4}

6.1.4 The DATEC Capability to Accomplish Sudden Service Failure Sensing (SSFSS), Omnistratametric Monitoring, and Nodal Control Monitoring

The SSFSS function was fully validated by Appendix A Procedures during the validation phase of field tests (refer to Section II, of the Field and Evaluation Report). If a major alarm signifying loss of service occurs, it is sensed and displayed on the Alarm Scanner at the site and at the nodal control Alarm Display within four seconds. The top or primary CRT display for major alarm monitoring is the System Overview page, which is the "home" or starting position for nodal control monitoring. Within 30 seconds after occurrence, a major alarm will be displayed on the System Overview; the highest alarm (in terms of the communication system hierarchy) at a particular site will be blinking. Omnistratametric monitoring is available at the System Overview in the form of hard equipment alarms and parameter alarms, and expands into the lower display pages (Link Status, Link P.A. and Maintenance Voltages) where key parameters from all levels of the communication system are alarmed and trended. Section II of the field test report deals with the quantitative aspects of this subject. The following examples--excerpts from the System Simulation Scenarios-- were chosen to illustrate the feasibility of nodal control and the effectiveness of omnistratametric monitoring.

The best example to illustrate complete monitoring through all levels of the communication system is a scenario involving problems at all levels. Appendix EE was intended to test DATEC's effectiveness as a tool in recognizing and isolating multiple, unrelated failures. Note that the problems were first observed at the System Overview level and then traced downward through the lower tier displays to their source. In a particular example, the scenario conducted on 21 June 1977, a total of 4 separate, unrelated problems were identified and isolated in a period of approximately 20 minutes.

Another scenario which presented a wide range of problems for the Tech Controller to solve was Appendix FF. The tech controller accurately notes in the scenario on 20 June 1977 that he could not have isolated all the faults using the System Overview; however, it will be noted that this display was frequently used as a starting point in problem isolation and presented a good overall picture of the link's operational status at any given time as the scenario progressed. It proved useful, then, in the process of nodal control.

6.1.5 The DATEC Performance in Both the Active Scan and the Special Request Modes of Operation

In addition to the active or normal scan mode of operation, there are two other modes that can be entered via operator interaction. These are Monitor Immediate and Self-Test.

UNRELATED MULTIPLE FAILURES-1

PROCEDURE	DATE	
EE1. At SBL, insert 10dB of attenuation in the A receiver waveguide attenuator.	6-21-77	1558
EE2. At SBL, inject ≈6 T1-4000 frame errors every 2-4 minutes using the FBEG. This is to be done with the NORMAL T1-4000 in service.		
EE3. At HUA, disable the NORMAL T1-4000 Channel 7 XMIT card by breaking the card edge connections to the card nest.		
EE4. At HUA, inject a 2600 Hz ± 10 Hz at -20 dBm; also inject 1000 Hz ± 10 Hz at -44 dBm.		
EE5. At HUA, remove the CONV. fuse from the T1WB1.		
EE6. Upon completion of the test, return all conditions to normal.		

CONDUCTED BY C L Christy 6-21-77

OBSERVED BY ____________

DATEC SYSTEM EVALUATION WORKSHEET 21 June 77 , Pg # 5

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems again Green...////RR		6/21	1540
System overview indicates Amber Inservice radio a t SBL...../ph	9/21 June 77		1557
Link status page one indicates amber RSL on SBL rec..../ph	9/21 June 77		1558
T1WB1 HUA?SBL in red att..../ph	10/21 June 77		1559
Request that maint pull in house loop on the T1WB1 at HUA and SBL..../ph			1600
Maint advise KHUA has a bad T1WB1..../ Still xx showing low RSL on the "A" Radio at SBL../cs			1602
Request SBL lock on his "B" Radio Rx, RSL problem on "A" Rx...Maint cont work on HUA's T1 WB1../cs	11/21 June 77		1605
Maint replace blown fuse on T1WB1 at HUA.,, still have a major alarm on same../cs	12/21 June 77		1606
SBL had a bad IF in their "A" Rx is being worked on now../Request Maint at SBL and HUA replace both Rx and Tx card s in the T1-4000 mux			1609
Major alarm on T1WB1 at HUA is cleared,,have an amber Rx on "B" radio at HUA../cs..Amber condition caused by low eye margin./cs	12/21 June 77		1612
Ma int advise bad Tx channel card at HUA and was was replaced,,, also showing an amber con on the "A" mux at SBL../cs			1618
Amber con on the T1-4000 ca used by XXX a bad Rx card at SBL /./cs			162 1

Problems Isolated Too:

1. Blown fuse on the T1WB1 at HUA
2. Bad IF in the "A" Recvr at SBL
3. Bad Xmit chnl card (chnl 7) on T1-4000 at HUA
4. Bad Recv common ca rd in the T1-4000 at SBL

Displays deemed useful

1. System Overview (initial indication)
2. Link Status, Pg # 1
3. Link Performance, Pg # 1

TECH CONTROLLER ____________

OBSERVED BY ____________

```
MAS                                     SYSTEM OVERVIEW                 TIME  172/1557:35
                    HUA         SBL
RADIO A              .        >IA.
      B              .          .
MUX  SW              .          .
      A              .          .
      B              .          .
CY104                .          .
                     .          .
                     .          .
                     .          .
                     .          .
                     .          .
                     .          .
                     .          .
TIMBI                .          .
                     .          .
                     .          .
              .......................
TELEMETRY.          .                .
          .          .                .
SITE      .          .                .
```

#9 21 June 77

MA-2 LINK STATUS TIME 172/1558:56

MAJOR ALARM

		......TI-4000......			......RADIO......	
		HUA	SBL		HUA	SBL
ALARM	SW MAJOR		.	TX PROB		.
	SW MINOR		.	RX PROB		.
	MAJOR		.			.
STATUS	TX IN SVC	A	. A	TX IN SVC	A	. A
	RX IN SVC	A	. A	RX IN SVC	A	. A
	MAINT		.	MAINT		.
PARAMETER	FER	<1.ØE-7	.<1.ØE-7	RX SQUELCH		.
	CRFRM		.	RSL MARGIN	33.Ø48	. 28.417 A
				EYE MARGIN	12.346	. 12.459
	BER COR	NO DATA	.NO DATA	EYE AMPL	-8.9677	.-8.9355
				EYE HITS	Ø.Ø	. Ø.Ø
				DER BER	6.2E-13	. 5.5E-13

PAGE 1

```
AS-2                                   SYSTEM OVERVIEW                   TIME  172/1559:30
                 HUA          SBL
RADIO A           .          >IA.
      B           .             .
MU  SW            .             .
     A            .             .
     B            .             .
CY1Ø4             .             .
                  .             .
                  .             .
                  .             .
                  .             .
                  .             .
                  .             .
                  .             .
T1WB1             .RØ!<><>Ø1R.
                  .             .
                  .             .
          ..........................
TELEMETRY.              .              .
          .             .              .
SITE      .             .              .
```

#10 21 June 77

```
MA-2                                  LINK STATUS                        TIME  172/1641:27
                                                            MAJOR ALARM
                               ......CY-104......              ......T1WB1......
                                      HUA       SBL                   HUA      SBL
   ALARM          SERVICE                .               OFFICE        *    .    *
                                         .                                  .
                                         .                                  .
                  REMOTE                 .                                  .
                                         .                                  .
                                         .                                  .
   STATUS         MAINT                  .               MAINT              .
                                         .                                  .
                                         .                                  .
   PARAMETER      CHANNEL                .               FER   <1.ØE-6  .<1.ØE-6
                                         .               REFRAME            .
                                         .
   SITE           ENTRY                  .
   ALARMS         FIRE                   .
                  AC PWR                 .
                  BATTERY                .
                  W.A. PR                .
                  W.G. HV                .
                  FLOOD                  .                                 PAGE 2
```

#11 21 June 77

MAC-1-01-06 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 172/1602:18

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
H'	RSLMAR	33.048	33.240	31.094	1.0048	27.369	10.649	--------	--------	DB
A	EYEMAR	12.346	12.573	11.759	1.0342	10.969	2.9468	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.95222	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	.94612	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	0.0	0.0	12.749	37.582	--------	--------	/SC
HUA	RSLMAR	33.378	33.404	32.079	.74519	27.611	9.1418	--------	--------	DB
B	EYEMAR	6.2500	5.9557	5.0263	1.1592	7.7197	2.5145	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.99167	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9947	--------	--------	--------	RATE
	EYEHIT	0.0	.00200	.05024	.07779	3.4285	5.2851	--------	--------	/SC
SBL	RSLMAR	28.417	38.138	39.500	.53373	37.956	2.3217	--------	--------	DB
A	EYEMAR	12.459	12.459	12.313	1.1348	12.688	2.1798	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9970	--------	--------	--------	RATE
	EYEHIT	0.0	72.818	.00308	.00872	1.8950	3.3837	--------	--------	/SC
SBL	RSLMAR	38.300	38.770	37.333	1.4462	33.937	2.6584	--------	--------	DB
B	EYEMAR	14.300	13.260	12.221	1.6287	13.274	1.1154	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9987	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00126	.00356	.47783	1.9274	--------	--------	/SC

AS-2 LINK STATUS TIME 172/1606:06

		......TI-4000...... HUA	SBL		......RADIO...... HUA	SBL
ALARM	SW MAJOR		.	TX PROB		.
	SW MINOR		.	RX PROB		.
	MAJOR		.			.
STATUS	TX IN SVC	A	. A	TX IN SVC	A	. A
	RX IN SVC	A	. A	RX IN SVC	A	. B
	MAINT		.	MAINT		.
PARAMETER	FER	<1.0E-7	.<1.0E-7	RX SQUELCH		.
	CRFRM		.	RSL MARGIN	33.167	. 38.300
				EYE MARGIN	12.005	. 14.300
	BER COR	NO DATA	.NO DATA	EYE AMPL	-8.9677	.-8.9355
				EYE HITS	0.0	. 0.0
				DFR BER	9.6E-13	. 5.5E-13

PAGE 1

12 21 June 77

MA-2 LINK STATUS TIME 172/1610:52

MAJOR ALARM

		......CY-104......			......T1WB1......	
		HUA	SBL		HUA	SBL
ALARM	SERVICE	.		OFFICE	* .	*
	REMOTE	.			.	
STATUS	MAINT	.		MAINT	.	
PARAMETER	CHANNEL	.		FER <1.ØE-6	.	.Ø1950 R
		.		REFRAME	.	
SITE ALARMS	ENTRY	.				
	FIRE	.				
	AC PWR	.				
	BATTERY	.				
	W.A. PR	.				
	W.G. HV	.				
	FLOOD	.				

PAGE 2

IO-ØØ5 SYSTEM OVERVIEW TIME 172/1612:10

	HUA	SBL
RADIO A		>SA.
B	.AS<	.
MUX SW	.	.
A	.	.
B	.	.
CY1Ø4	.	.
T1WB1	.	>Ø1A.

TELEMETRY. . .

UNRELATED MULTIPLE PROBLEMS, 2

PROCEDURE	DATE	TIME
FF1. At SBL, fail TX A by dis-connecting the XMIT pilot at J105/P105 cable connector.	6-20-77	1322
FF2. At SBL, insert 10 dB attenuation in the B wave-guide attenuator.		1322
FF3. At SBL, remove the fuse from the STBY TI-4000.		1322
FF4. At SBL, using the FBEG in the SHORT mode insert ≈ 6 frame errors every 2-4 minutes		
FF5. At SBL, remove the Channel 7 Receive Card from the TI-4000 A unit		1328
FF6. At HUA, place the B Transceiver in Maintenance (Lock RX on A)		1336
FF7. At HUA, insert 33 dB atten. in the "A" IF attenuator inserted between the Equalizer and the IF amp.		1336
FF8. At HUA, inject F_o + 6.3 MHz into both the "A" & "B" receivers. Set the level to -50 dBm.		
FF9. At SBL, connect one side of CY-104 Channel 1 Receive filter, FL-1 to ground.		
FF10. Upon completion of testing return the equipment to NORMAL configuration.		1402
Requested switchover to A MUX @ 1340 - replaced fuse @ that time. Reconnected P105/J105 @ 1342. Removed attenuation from B waveguide at 1348.		
CONDUCTED BY C. L. Christney 6-20-77		
OBSERVED BY		
Removed atten. from A RX @ HUA at 1402		

DATEC SYSTEM EVALUATION WORKSHEET 20 June 77 Pg # 4

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems again Green...////RR		6/20	1245
Overview indicates problems with "A" radio at SBL, "B" mux at SBL, and also shows both radios at HUA amber...Displays indicate that the T1-4000 is Red..///RR	15/20 June 77		1322
Requested maint at SBL, switch to their "A" mux (to restore service)...///RR			1326
A gain requested maint at SBL switch to their "A" mux...not done as yet....They advsd that they had blown fuse in "B" mux, causing this to go red...They replaced same....			1336
Requested SBL check their "A" Xmittr as display shows it bad...Also requested they check output power on "B" xmttr, as our RSL is low...They advsd they back on "A" mux ATT...////RR	17/20 June 77 18/20 June 77		1337
SBL maint advsd of brkn wire on the "A" Xmttr and they repaired same.. and placed the "A" Xmttr on the air...///RR	19/20 June 77		1343
Requested SBL checker their antenna alignment due to low RSL'S on both at HUA, and on "B" a t SBL.....They also advsd tha t the "B" xmttr had output pwr problem, which they corrected..//RR			1346
Maint advsd no problem with antenna's...Showing RED Flag on the T1WB1, here and at SBL..Requested both HUA and SBL place the T1WBL in loop to chker out..///RR			1353
Maint advs both T1WB1 loops good...Requested they check chnl cards on the T14000 for the T1WB1 chnl..//RR	20/20 June 77		1355
Chnls on T14000 at HUA good, requested SBL chk his chnls...////RR			1357
SBL maint advs he had bad recv chnl on his T1-4000 replaced card...////Also, ATT requested HUA maint check the "A" recvr as still showing low RSL..///RR	21/20 June 77		1359
Maint advsd of bad IF in "A" recvr at HUA, repaired same and back on line..////RR			1402
Systems all clear and green...////RR			1413

CONT ON PAGE # 5

TECH CONTROLLER R

OBSERVED BY Cms

AD-A051 926 HONEYWELL INC ST PETERSBURG FL AVIONICS DIV F/G 17/2
ATEC DIGITAL ADAPTATION STUDY, DEVELOPMENT AND FIELD EVALUATION--ETC(U)
JAN 78 T J CAMPBELL, W F ACKER, C L CHRISTNER F30602-75-C-0282
UNCLASSIFIED 1077-14813-VOL-2 RADC-TR-77-431-VOL-2 NL

2 OF 4
AD
A051926

DATEC SYSTEM EVALUATION WORKSHEET 20 June 77, Pg # 5

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
PROBLEMS ISOLA TED TO (cont frm pg # 4) 1. Bad "A " Recv radio at HUA (bad IF) 2. Bad "A" xmittr radio at SBL (Brkn wire) 3. Bad "B" xmttr at SBL (low output pwr) 4. Blown fuse in "B" mux a t SBL 5. Bad recv chnl card on T1-4000 at SBL			
Most useful displays.... 1. LS, Pg # 1 2. LP, Pg # 1 3. LS, Pg # 2 NOTE: A lthough the overview was useful in initially showing there were problems, I don't feel I could have isolated these problems by just using the OverView...////RR TECH CONTROLLER [signature] OBSERVED BY Cms			

#15 20 June 77

```
IQ-007                                 SYSTEM OVERVIEW              TIME  171/1322:34
               HUA          SBL                       MAJOR ALARM
RADIO A         .          <SR.
      B         .             .
MUX SW          .          <>R.
     A          .             .
     B          .          <>R.
CY104           .             .
                .             .
                .             .
                .             .
                .             .
                .             .
                .             .
TI/31           .             .
                .             .
                .             .
         ......................
TELEMETRY.              .       .
SITE     .              .       .
```

```
MA-2                                   SYSTEM OVERVIEW              TIME  171/1324:25
               HUA          SBL                       MAJOR ALARM
RADIO A        .AI<        <SR.
      B        .AS<           .
MUX SW          .          <>R.
     A          .             .
     B          .          <>R.
CY104           .             .
                .             .
                .             .
                .             .
                .             .
                .             .
                .             .
TI/31          .AJ1<          .
                .             .
                .             .
         ......................
TELEMETRY.              .       .
SITE     .              .       .
```

---- . . .

#16 20 June 77

```
MA                                          SYSTEM OVERVIEW              TIME  171/1327:14
               HUA       SBL                               MAJOR ALARM
RADIO A        .AI<     <SR.
      B        .AS<     >SA.
MUX SW          .       <>R.
    A          .AI<       .
    B           .       <>R.
CY1Ø4           .         .
                .         .
                .         .
                .         .
                .         .
                .         .
                .         .
T1WB1          .AØ1<      .
                .         .
                .         .
     .......................
TELEMETRY.          .          .
         .          .          .
SITE     .          .          .
```

```
MA-2                                        SYSTEM OVERVIEW              TIME  171/1331:24
               HUA       SBL                               MAJOR ALARM
RADIO A        .AI<     <SR.
      B        .AS<     >SA.
MUX SW          .       <>R.
    A           .         .
    B           .       <>R.
CY1Ø4           .         .
                .         .
                .         .
                .         .
                .         .
                .         .
                .         .
                .         .
T1WB1          .RØ1<><>Ø1R.
                .         .
                .         .
     .......................
T   EMETRY.          .          .
          .          .          .
SITE      .          .          .
```

```
AS-2                                    LINK STATUS                              TIME  171/1334:20
                                    ......T1-4000......                          ......RADIO......
                                   HUA            SBL                             HUA          SBL
  ALARM          SW MAJOR                    .      *        TX PROB                     .       A
                 SW MINOR                    .      *        RX PROB                     .
                 MAJOR                       .      B                                    .
  STATUS         TX IN SVC          A        .      B        TX IN SVC         A         .       B
                 RX IN SVC          A        .      B        RX IN SVC         A         .       A
                 MAINT                       .               MAINT                       .
  PARAMETER      FER              <1.0E-7    .  .00017 R     RX SQUELCH                  .
                 CRFRM                       .      *        RSL MARGIN    18.113  R.  40.778
                                                             EYE MARGIN    15.290   .  12.687
                 BER COR          NO DATA    .  8.5506 R     EYE AMPL      -9.3704  .-8.9677
                                                             EYE HITS        0.0    .     0.0
                                                             DER BER       1.0E-15  .  4.0E-13
                                                                                PAGE 1
```

#17 20 June 77

```
MA-2                                 SYSTEM OVERVIEW                          TIME  171/1340:30
               HUA        SBL                              MAJOR ALARM
RADIO A        .RS<       <SR.
      B        .AI<       >SA.
MUX SW         .            .
     A         .            .
     B         .            .
CY104          .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
T1NB1          .R01<><>01R.
               .            .
               .            .
            .........................
TELEMETRY.           .          .
            .           .          .
S   E       .           .          .
```

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 171/1342:38

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3[illegible] MTHS MEAN	LAST 3[illegible] MTHS DEV	
HUA	RSLMAR	-9.ØØØØ	15.222	32.774	2.ØØØ9	27.258	1Ø.947	--------	--------	DB
	EYEMAR	15.29Ø	14.329	1Ø.916	4.2686	1Ø.985	3.9315	--------	--------	DB
	RSLAVL	Ø.Ø	.71429	1.ØØØØ	--------	.95196	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	.97436	--------	.94553	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	9.271Ø	19.16Ø	12.719	3Ø.671	--------	--------	/SC
HUA B	RSLMAR	21.Ø44	26.3Ø8	32.214	.79179	27.383	9.3573	--------	--------	DB
	EYEMAR	8.9786	8.3161	6.8315	1.2755	7.83Ø1	2.5446	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.99143	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9946	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	.Ø9956	.Ø5286	.1Ø96Ø	3.6265	5.3731	--------	--------	/SC
SBL A	RSLMAR	4Ø.778	4Ø.286	39.2Ø7	.67677	37.851	2.3474	--------	--------	DB
	EYEMAR	12.687	12.762	12.615	.38211	12.675	2.2423	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93393	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9962	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	2.Ø365	3.4195	--------	--------	/SC
SBL B	RSLMAR	28.933	34.613	37.39Ø	.68436	33.726	2.5847	--------	--------	DB
	EYEMAR	12.573	12.573	13.143	.15ØØØ	13.283	1.1471	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98393	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9987	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.ØØ6ØØ	.Ø1342	.54592	1.9797	--------	--------	/SC

#18 20 June 77

```
MA-2                              SYSTEM OVERVIEW              TIME 171/1344:29
                 HUA        SBL                       MAJOR ALARM
RADIO A         .RS<         .
      B         .AI<     >SA.
MUX SW          .            .
    A           .            .
    B           .            .
CY1Ø4           .            .
                .            .
                .            .
                .            .
                .            .
                .            .
                .            .
T1WB1           .RØ1<><>Ø1R.
                .            .
                .            .
          .......................
TELEMETRY.          .           .
          .         .           .
SITE      .         .           .
```

BEST AVAILABLE COPY

#19 20 June 77

```
IA-2                         SYSTEM OVERVIEW                  TIME  171/1349:?3
            HUA           SBL                        MAJOR ALA?
RADIO A      .AS<          .
      B      .          >SA.
MIX SW       .             .
      A      .             .
      B      .             .
CY104        .             .
             .             .
             .             .
             .             .
             .             .
             .             .
             .             .
             .             .
             .             .
             .             .
TINB1        .RØ1<><>ØIR.
             .             .
             .             .
             .             .
          .........................
TELEMETRY.        .            .
          .        .            .
SITE      .        .            .
```

MAC-1-18-23 MAINTENANCE VOLTAGES - HUA TIME 171/135?:48

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TINB1+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	15.5	.Ø21	153/ØØØ7
Ø2	TINB1+12	12.3	G	13.2	12.6	12.Ø	11.4	10.8	12.3	.ØØ7	153/ØØØ7
Ø3	T14ØØØ+5	4.94	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	.ØØ4	153/ØØØ7
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø3	Ø	153/ØØØ7
Ø5	RADIO+24	23.9	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.Ø21	153/ØØØ7
Ø6	RADIO-24	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.ØØ5	153/ØØØ7

#20 20 Jun 77

```
MA?-1-18-23                        LINK STATUS                        TIME  171/1351:41
                            ......CY-104......                    ......T1WB1......
                             HUA         SBL                        HUA       SBL
 ALARM         SERVICE               .                  OFFICE       *    .    *
                                     .                                    .
               REMOTE                .                                    .
                                     .                                    .
                                     .                                    .
 STATUS        MAINT                 .                  MAINT             .
                                     .                                    .
                                     .                                    .
 PARAMETER     CHANNEL               .                  FER    .Ø195Ø R.  .Ø195Ø R
                                     .                  REFRAME      *    .    *
                                     .
 SITE          ENTRY                 .
 ALARMS        FIRE                  .
               AC PWR                .
               BATTERY               .
               W.A. PR               .
               W.G. HV               .
               FLOOD                 .                                  PAGE 2
```

```
MA-2                               LINK STATUS                        TIME  171/1356:25
                                                               MAJOR ALARM
                            ......T1-4ØØØ......                        ......RADIO......
                              HUA          SBL                           HUA        SBL
 ALARM        SW MAJOR                .                 TX PROB                 .
              SW MINOR                .                 RX PROB                 .
              MAJOR                   .                                         .
 STATUS       TX IN SVC        A      .      A          TX IN SVC        A      .     B
              RX IN SVC        A      .      A          RX IN SVC        B      .     A
              MAINT                   .                 MAINT                   .
 PARAMETER    FER           .ØØ162 R.<1.ØE-7            RX SQUELCH              .
              CRFRM            *      .      *          RSL MARGIN  3Ø.927   . 4Ø.778
                                                        EYE MARGIN  8.9786   . 12.687
              BER COR       1Ø.579 R.NO DATA            EYE AMPL   -9.5556   .-8.9677
                                                        EYE HITS       Ø.Ø   .    Ø.Ø
                                                        DER BER    4.3E-14   . 4.ØE-13
                                                                              PAGE 1
```

#21   20 June 77

```
                   MAS                              SYSTEM OVERVIEW
               HUA      SBL
RADIO A        .AS<      .
      B        .         .
MUX SW         .         .
    A          .AI<      .
    B          .         .
CY104          .         .
               .         .
               .         .
               .         .
               .         .
               .         .
               .         .
T1WB1          .A01<  >01A.
               .         .
               .         .
        ..........................
TELEMETRY.          .          .
        .           .          .
SITE    .           .          .
```

```
IO-006                          SYSTEM OVERVIEW                 TIME  171/14:02:20
               HUA      SBL
RADIO A        .         .
      B        .         .
MUX SW         .         .
    A          .AI<      .
    B          .         .
CY104          .         .
               .         .
               .         .
               .         .
               .         .
               .         .
               .         .
T1WB1          .      >01A.
               .         .
               .         .
        ..........................
TELEMETRY.          .          .
        .           .          .
S  E    .           .          .
```

The Monitor Immediate mode was implemented just prior to field tests and replaced another similar mode called Temporary Scan, which was in use during in-plant tests at Honeywell. This mode features an abbreviated scan which monitors only those parameters selected by the operator in the nodal command statement entered via the keyboard. Proper operation of this mode was verified by the validation test procedures of Appendix B of the Field Test Plan and Procedures. During System Simulation Scenarios, it proved to be a very effective and time-saving tool which the tech controllers used extensively. It was very useful in verifying hard communication system failures as opposed to momentary transients which might have appeared on the CRT display during normal scanning. For a radio parameter derived from the Baseband Eye Monitor, it would take between 7 and 8 minutes for such a condition to clear. In the Monitor Immediate mode, eye parameters can be rescanned in a matter of seconds.

Appendix N, 14 June 1977, simulating malalignment of both antennas at Sibyl, serves as one example of the usefulness of this mode. Observing Link P.A., Page 1, while in Monitor Immediate, gave the Tech Controller an almost real-time picture of the problem.

Another example of use of the Monitor Immediate mode was illustrated during conduction of an Appendix U scenario on 8 June 1977. In this case the parameters being monitored (RSL Margin and Eye Margin), were not the source of the problem; however, by being able to use Monitor Immediate mode and get quick updates, the tech controller was able to determine this without having to wait for the normal scan to update the parameters.

Use of the Self-TEst mode was not written into the Field Test Plan/ Procedures document. This was an oversight. This mode of operation, however, was put to use several times during the field test phase of the program. In this mode, the MAC, EPUT, or BEM units may be individually addressed while in Operator Interaction and commanded to enter the self-test mode. The unit is caused to act upon stimuli generated internally in place of active data input, and to output a known result. The unit is then queried by the nodal control software and caused to transmit its data in the same manner as it would during a normal scan. The results-- GO or NO GO-- are then displayed on the CRT display.

Although there were no tests written into the Test Plan/Procedures document to demonstrate the Self-Test mode, there are nevertheless entries made on the DATEC System Evaluation Worksheets by the tech controllers and also Hardware Log entries which document use of this mode. The examples chosen in this instance involves test of the MAC unit at Site Sibyl which did not respond properly during the Normal Scan mode at the start of operations on 24 June. The DATEC System Evaluation Worksheets and Logbook entries indicating this are shown on pages 337, 338 and 339.

PROCEDURE	DATE	TIME
Reciprocal Path Problem		
N1. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at both HUA and SBL. (Accomplished by introducing 10dB of attenuation in both TX and RX A wave-guides at SIBYL)	6-14-77	1047
Transmit Antenna Only at Sibyl		
N2. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at HUA and the B receiver only at SBL.		
N3. Restore equipment to baseline configuration		
Requested to lock on B TX @ HUA.		
CONDUCTED BY C. L. Christner 6-14-77		
OBSERVED BY ______		

DATEC SYSTEM EVALUATION WORKSHEET

Page 3   14 June 77

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All systems green ./cs		6/14	1033
Degraded RSLs at SBL on both radios... Request maint switch to "B" Tx at HUA./cs	9/14 JUNE 77		1049
RSLs at HUA a re also low... Fade seems independent ot TXs... HUA going back to "A" Tx../cs	10/14 JUNE 77		1052
~~[illegible]~~			~~[illegible]~~
X Request maint look into problem of low RSL... they advise that SBL was aligning both antennas at the same time.. request that they leave the antennas alone. ./cs	10/14 JUNE 77		1054
Problem cleared .			1102

Problem isolated to antenna alignment at SBL.

Displays deemed most useful...

1) LS page 1
2) LP page 1 (MI was useful for fast update of RSLs)

TECH CONTROLLER R

OBSERVED BY CNS

#9 14 June 77

IO-ØØ6 LINK STATUS TIME 165/1Ø33:15

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	3Ø.776	.	37.1ØØ
					EYE MARGIN	13.831	.	12.8ØØ
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8Ø65	.	-8.9355
					EYE HITS	Ø.Ø	.	.Ø6933 A
					DER BER	8.4E-14	.	3.5E-13

PAGE 1

MAS LINK STATUS TIME 165/1Ø48:43

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	3Ø.889	.	27.455 A
					EYE MARGIN	13.597	.	12.233
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8Ø65	.	-8.9677
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.2E-13	.	7.3E-13

PAGE 1

BEST AVAILABLE COPY

BEST AVAILABLE COPY

#10 14 June 77

IQ-ØØ5 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/1Ø49:47

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	3Ø.889	3Ø.843	3Ø.1Ø2	1.Ø384	27.695	6.6582	--------	--------	DB
A	EYEMAR	13.597	13.467	12.877	1.Ø429	11.Ø58	3.4363	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.94172	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93539	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	5.2767	17.Ø98	18.384	46.963	--------	--------	/SC
HUA	RSLMAR	28.Ø58	3Ø.994	25.75Ø	7.3Ø45	29.8Ø4	2.3211	--------	--------	DB
B	EYEMAR	5.9534	5.9534	6.679Ø	3.1434	7.7781	2.8828	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	Ø.9966	--------	Ø.9938	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9955	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	8.261Ø	21.ØØ3	4.Ø6Ø8	4.8525	--------	--------	/SC
SBL	RSLMAR	27.455	34.232	38.813	1.3Ø72	38.158	1.3833	--------	--------	DB
A	EYEMAR	12.233	13.281	13.459	.85297	13.175	.53384	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9985	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	.Ø1733	16.238	51.564	2.3326	3.5727	--------	--------	/SC
SBL	RSLMAR	24.Ø83	31.252	34.Ø67	.85813	33.564	1.3188	--------	--------	DB
B	EYEMAR	12.8ØØ	12.8ØØ	13.396	.8356Ø	12.925	1.1839	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9984	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø8817	.23112	.77622	2.4187	--------	--------	/SC

MAC-1-Ø1-Ø2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/1Ø51:25

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	21.1Ø9	3Ø.843	3Ø.1Ø2	1.Ø384	27.695	6.6582	--------	--------	DB
A	EYEMAR	13.597	13.467	12.877	1.Ø429	11.Ø58	3.4363	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.94172	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93539	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	5.2767	17.Ø98	18.384	46.963	--------	--------	/SC
HUA	RSLMAR	18.458	3Ø.994	25.75Ø	7.3Ø45	29.8Ø4	2.3211	--------	--------	DB
B	EYEMAR	5.9534	5.9534	6.679Ø	3.1434	7.7781	2.8828	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	Ø.9966	--------	Ø.9933	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9955	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	8.261Ø	21.ØØ3	4.Ø6Ø8	4.8525	--------	--------	/SC
SBL	RSLMAR	27.455	34.232	38.813	1.3Ø72	38.158	1.3333	--------	--------	DB
A	EYEMAR	1Ø.899	12.8Ø4	13.459	.85297	13.175	.53384	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9985	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	.Ø1387	16.238	51.564	2.3326	3.5727	--------	--------	/SC
SBL	RSLMAR	24.Ø83	31.252	34.Ø67	.85813	33.564	1.3188	--------	--------	DB
	EYEMAR	12.8ØØ	12.8ØØ	13.396	.8356Ø	12.925	1.1839	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9934	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø8817	.23112	.77622	2.4187	--------	--------	/SC

PROCEDURE	DATE	TIME
U1. Install the Frame Bit Error Generator (FBEG) between the radio and T1-4000 in the RX baseband input line at SEL.	6-8-77	
U2. With the selector switch of the FBEG set to NARROW, momentarily depress the pushbutton switch several times (3-5). Repeat this operation at a rate of approxiamtcly once every 5 minutes. Record the time when each operation is performed.	6-8-77	
Perturbation No. 1		0938
" " 2		0943
" " 3		0947
" " 4		0952
" " 5		0958
" " 6		1010
" " 7		1018
" " 8		1025
" " 9		1030
" " 10		1033
11		1036
12		1038
U3. When test is completed, restore equipment to baseline configuration.	6-8-77	
13		1041
14		1045
15		1048

CONDUCTED BY C. L. Christner 6-8-77

OBSERVED BY ____________

DATEC SYSTEM EVALUATION WORKSHEET 8 June 77 Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting 8 June 77, with systems green, and data attached...////RR	1-4/8 June 77	6/8	0910
RT display shows Amber in-service for the MUX at SBL...Isolating problem ATT...//////RR	5/8 June 77	6/8	0940
Link Status display shows FER Amber and BER COR Red at SBL.../PH	5/8 June 77 6/8 June 77	6/8	0942
After accessing the system statistics for SBL. found RSL Margin droppped 5 db, Eye margin dropped 1 db over the last hour..../PH	7/8 June 77	6/8	0950
Mux amber cleared and T1WB1 at SBL in amber att, Still trying to isolate pblm.../ph	8/8 June 77	6/8	1000
Still trying to isolate cause of RSL and Eye Margin drop..Watching RSL/Eye data on Monitor Immediate, slowly dropping.../ph		6/8	1030
Both T1-4000 and T1WB1 alarms have cleared off the system overview, but FER is still high and listed in the Amber zone on the Link Status display, also the BER COR is still in the Red zone. Suspect problem is at SBL but have not isoltaed as yet./ph	9/8 June 77	6/8	1045
Requested SBL Maint switch Mux to the "B" rcvr. This cleared the Amber and Red off the SBL Mux and the Link Status Display./ph		6/8	1050
SBL Changed out Rcv unit card on the T1-4000 Mux and Switched back to the "a" mux./ph		6/8	1055
Problem cleared and logged as a bad RCV Card in the T1-4000 Mux at SBL, replaced.../ph		6/8	1105

TECH CONTROLLER ____________

OBSERVED BY ____________

#1 8 June 77

10-007			SYSTEM OVERVIEW	TIME 159/0921:47
	HUA	SBL		
RADIO A	.			
B	.	.		
MUX SW	.	.		
A	.	.		
B	.	.		
CY104	.	.		
TIWB1	.	.		
TELEMETRY	.	.	.	
SITE	.	.	.	

AS-2 LINK STATUS TIME 159/0922:34

NO RESPONSE.

		......T1-4000......			......RADIO......	
		HUA	SBL		HUA	SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB		
	MAJOR					
STATUS	TX IN SVC	A	A	TX IN SVC	A	A
	RX IN SVC	A	A	RX IN SVC	A	A
	MAINT			MAINT		
PARAMETER	FER	<1.0E-7	<1.0E-7	RX SQUELCH		
	CRFRM			RSL MARGIN	34.133	39.500
				EYE MARGIN	11.562	14.660
	BER COR	NO DATA	NO DATA	EYE AMPL	-8.8065	-8.9677
				EYE HITS	0.0	0.0
				DER BER	1.7E-12	2.5E-14

PAGE 1

#2 8 June 77

```
                              LINK STATUS                         TIME  159/Ø924:14
                       ......CY-1Ø4......                   ......TIWB1......
                           HUA        SBL                        HUA        SBL
ALARM          SERVICE          .                 OFFICE              .
                                .                                     .
               REMOTE           .                                     .
                                .                                     .
STATUS         MAINT            .                 MAINT               .
                                .                                     .
PARAMETER      CHANNEL          .                 FER     <1.ØE-6     .<1.ØE-6
                                .                 REFRAME             .
SITE           ENTRY            .
ALARMS         FIRE             .
               AC PWR           .
               BATTERY          .
               W.A. PR          .
               W.G. HV          .
               FLOOD            .                                          PAGE 2
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IQ-ØØ5 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 159/Ø925:59

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	34.133	2.9833	6.7219	11.491	29.652	.21836	--------	--------	DB
A	EYEMAR	11.562	-7.2484	1.6522	6.7311	1Ø.989	2.3534	--------	--------	DB
	RSLAVL	1.ØØØØ	.2ØØØØ	.42642	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	.25ØØØ	.43Ø66	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	227.56	165.38	115.41	.Ø4112	.Ø4319	--------	--------	/SC
HUA	RSLMAR	34.718	34.459	32.274	1.9129	3Ø.284	2.Ø8ØØ	--------	--------	DB
B	EYEMAR	1Ø.462	1Ø.462	1Ø.219	2.2531	5.5974	2.3299	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.99245	--------	.985Ø5	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9971	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	2.6ØØ6	11.336	4.5383	5.4634	--------	--------	/SC
SBL	RSLMAR	39.5ØØ	4Ø.127	38.716	1.Ø96Ø	39.237	1.2267	--------	--------	DB
A	EYEMAR	14.66Ø	14.629	13.432	.22425	12.611	.51716	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.994Ø	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø1713	.Ø7455	3.7986	4.1931	--------	--------	/SC
SBL	RSLMAR	33.364	33.3ØØ	33.591	.ØØ691	34.978	.73836	--------	--------	DB
B	EYEMAR	14.421	14.421	13.434	.2Ø247	12.Ø59	1.625Ø	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9941	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	2.1Ø79	3.6463	--------	--------	/SC

ØØ EM-1-M1-1ØAØØ ØØØ ØØØMAC-1-Ø1-Ø6AØØ

#3 8 June 77

MAC-1-07-12 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 159/0928:51

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	DEV	LAST 30 DAYS MEAN	DEV	LAST 30 MTHS MEAN	DEV	
HUA	EYEVOL	-3.7900	-6.0322	-5.0005	.72816	-3.9761	.20880	--------	--------	VLTS
A	RXSQH	0.0	0.0	5.0000	--------	1.0000	--------	--------	--------	RTE
H.	EYEVOL	-4.0200	-4.0200	-4.0490	.21777	-4.4673	.22405	--------	--------	VLTS
B	RXSQH	0.0	0.0	0.0	--------	11.000	--------	--------	--------	RTE
HUA	LNKAVL	1.0000	1.0000	1.0000	--------	0.9986	--------	--------	--------	RTE
SBL	EYEVOL	-3.6500	-3.6525	-3.7547	.02505	-3.8295	.04657	--------	--------	VLTS
A	RXSQH	0.0	0.0	0.0	--------	11.000	--------	--------	--------	RTE
SBL	EYEVOL	-3.6700	-3.6700	-3.7544	.01766	-3.8836	.14636	--------	--------	VLTS
B	RXSQH	0.0	0.0	0.0	--------	6.0000	--------	--------	--------	RTE
SBL	LNKAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE

MAS LINK PERFORMANCE ASSESSMENT - T1-4000 TIME 159/0930:07

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	DEV	LAST 30 DAYS MEAN	DEV	LAST 30 MTHS MEAN	DEV	
HUA	FER	1.0E-15	7.3E-6	1.3E-6	--------	1.8E-10	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	4.0000	7.0000	--------	1.5000	.86603	--------	--------	RTE
	CR/SQH	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	2.0000	6.0000	--------	0.0	--------	--------	--------	RTE
HUA	FER	1.0E-15	6.7E-17	1.4E-18	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	2.0000	--------	3.5000	2.9580	--------	--------	RTE
	CR/SQH	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
SBL	FER	8.8E-8	8.8E-9	3.0E-8	--------	1.3E-7	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	2.5000	2.2913	--------	--------	RTE
	CR/SQH	0.0	0.0	0.0	--------	4.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	5.0000	--------	--------	--------	RTE
SBL	FER	5.2E-10	1.7E-11	3.9E-6	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	1.7500	1.4790	--------	--------	RTE
	CR/SQH	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE

#4 8 JUNE 77

MAS LINK PERFORMANCE ASSESSMENT - TIWBI TIME 159/0931:17

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.2E-14	8.9E-6	3.8E-6	--------	3.5E-10	--------	--------	--------	RTE
	RFRM	0.0	5.0000	3.0000	--------	6.0000	4.7434	--------	--------	RTE
SB'	FER	1.2E-14	2.8E-15	4.2E-15	--------	3.2E-6	--------	--------	--------	RTE
	RFRM	0.0	0.0	5.0000	--------	3.5000	3.2016	--------	--------	RTE

IQ-008 MAINTENANCE VOLTAGES - HUA TIME 159/0932:22

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	TIWBI+15	15.5	G	16.5	15.7	15.0	14.2	13.5	15.5	.037	153/0907
02	TIWBI+12	12.4	G	13.2	12.6	12.0	11.4	10.8	12.4	.019	153/0907
03	TI4000+5	4.95	G	5.50	5.25	5.00	4.75	4.50	4.94	.012	153/0907
04	TI4000-6	-6.08	G	-5.40	-5.70	-6.00	-6.30	-6.60	-6.08	0	153/0907
05	RADIO+24	23.9	G	26.4	25.2	24.0	22.8	21.6	23.9	.030	153/0907
06	RADIO-20	-19.9	G	-18.0	-19.0	-20.0	-21.0	-22.0	-19.9	.005	153/0907

MA. 3-01-06 MAINTENANCE VOLTAGES - SBL TIME 159/0933:28

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	TIWBI+15	15.2	G	16.5	15.7	15.0	14.2	13.5	15.1	.016	153/0911
02	TIWBI+12	12.3	G	13.2	12.6	12.0	11.4	10.8	12.3	0	153/0911
03	TI4000+5	4.95	G	5.50	5.25	5.00	4.75	4.50	4.95	0	153/0911
04	TI4000-6	-6.05	G	-5.40	-5.70	-6.00	-6.30	-6.60	-6.04	.006	153/0911
05	RADIO+24	24.1	G	26.4	25.2	24.0	22.8	21.6	24.1	.014	153/0911
06	RADIO-20	-20.1	G	-18.0	-19.0	-20.0	-21.0	-22.0	-20.1	1.6E	153/0911

5/18

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MAC-1-Ø7-12                     SYSTEM OVERVIEW                    TIME  159/Ø941:56
               HUA        SBL
RADIO A         .          .
      B         .          .
MUX SW          .          .
      A         .      >IA .
      B         .          .
CY1Ø4           .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
                .          .
TIWBI           .          .
                .          .
                .          .
          .......................
TELEMETRY.           .          .

SITE      .          .          .
MAS                           LINK STATUS                         TIME  159/Ø942:5Ø
                       ......T1-4ØØØ......                       ......RADIO......
                            HUA         SBL                            HUA        SBL
   ALARM        SW MAJOR            .                TX PROB                .
                SW MINOR            .                RX PROB                .
                MAJOR               .                                       .
   STATUS       TX IN SVC      A    .     A          TX IN SVC      A       .     A
                RX IN SVC      A    .     A          RX IN SVC      A       .     A
                MAINT               .                MAINT                  .
    ARAMETER    FER       <1.ØE-7   .  1.8E-7 A      RX SQUELCH             .
                CRFRM               .                RSL MARGIN   29.615    . 37.6ØØ
                                                     EYE MARGIN   12.687    . 14.182
                BER COR   NO DATA   .  6.5459 R      EYE AMPL    -3.8Ø65    .-3.9677
                                                     EYE HITS        Ø.Ø    .    Ø.Ø
                                                     DER BER     4.ØE-13    . 5.1E-14
                                                                             PAGE 1
```

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IQ-008 LINK PERFORMANCE ASSESSMENT - T1-4000 TIME 159/0944:47

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
H	FER	1.0E-15	7.3E-6	1.3E-6	--------	1.8E-10	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	4.0000	7.0000	--------	1.5000	.86603	--------	--------	RTE
	CR/SQH	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	2.0000	6.0000	--------	0.0	--------	--------	--------	RTE
HUA	FER	1.0E-15	6.7E-17	1.4E-18	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	2.0000	--------	3.5000	2.9580	--------	--------	RTE
	CR/SQH	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	1.0000	--------	0.0	--------	--------	--------	RTE
SBL	FER	1.8E-7	1.8E-8	3.0E-8	--------	1.3E-7	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	2.5000	2.2913	--------	--------	RTE
	CR/SQH	0.0	0.0	0.0	--------	4.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	5.0000	--------	--------	--------	RTE
SBL	FER	5.2E-10	1.7E-11	3.9E-6	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	--------	--------	--------	--------	RTE
	CRFRM	0.0	0.0	0.0	--------	1.7500	1.4790	--------	--------	RTE
	CR/SQH	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE

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```
            NC,AC,SS,SBL

PARAMETER ?1

TI    PERIOD ?H
Ø1    37.7ØØ        17   OMIT         33   OMIT
Ø2    37.6ØØ        18   OMIT         34   OMIT
Ø3    38.1ØØ        19   OMIT
Ø4    39.5ØØ        2Ø   OMIT
Ø5    39.875        21   OMIT
Ø6    39.25Ø        22   OMIT
Ø7    39.5ØØ        23   OMIT
Ø8    39.875        24   OMIT
Ø9    41.667        25   OMIT
1Ø    41.222        26   OMIT
11   OMIT           27   OMIT
12   OMIT           28   OMIT
13   OMIT           29   OMIT
14   OMIT           3Ø   OMIT
15   OMIT           31   OMIT
16   OMIT           32   OMIT

TIME PERIOD ?
```

```
            NC,AC,SS,SBL

PARAMETER ?9

TIME PERIOD ?H
Ø1    13.831        17   OMIT         33   OMIT
Ø2    14.182        18   OMIT         34   OMIT
Ø3    14.66Ø        19   OMIT
Ø4    14.542        2Ø   OMIT
Ø5    14.421        21   OMIT
Ø6    14.895        22   OMIT
Ø7   OMIT           23   OMIT
Ø8   OMIT           24   OMIT
Ø9   OMIT           25   OMIT
1Ø   OMIT           26   OMIT
11   OMIT           27   OMIT
12   OMIT           28   OMIT
13   OMIT           29   OMIT
14   OMIT           3Ø   OMIT
15   OMIT           31   OMIT
16   OMIT           32   OMIT

TIME PERIOD ?
```

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```
          IQ-ØØ7                                SYSTEM OVERVIEW                    TIME
            HUA        SBL
RADIO A      .          .
      B      .          .
MUX SW       .          .
     A       .          .
     B       .          .
CY1Ø4        .          .
             .          .
             .          .
             .          .
             .          .
             .          .
             .          .
             .          .
TIWB1        .      >Ø1A.
             .          .
             .          .
        ......................
TELEMETRY.         .         .
         .         .         .
SITE     .         .         .



AS-2                               LINK STATUS                       TIME  159/1ØØ5:17
                          ......CY-1Ø4......                   ......TIWB1......
                              HUA        SBL                        HUA      SBL
  ALARM          SERVICE            .                  OFFICE            .
                                    .                                    .
                 REMOTE             .                                    .
                                    .                                    .
  STATUS         MAINT              .                  MAINT             .
                                    .                                    .
  PARAMETER      CHANNEL            .                  FER    <1.ØE-6    .  2.2E-6 A
                                    .                  REFRAME           .
  SITE           ENTRY              .
  ALARMS         FIRE               .
                 AC PWR             .
                 BATTERY            .
                 W.A. PR            .
                 W.G. HV            .
                 FLOOD              .                                      PAGE 2
```

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```
MAS                       LINK PERFORMANCE ASSESSMENT - T1WB1       TIME  159/1[illegible]6:51
                LAST  LAST HR    LAST 24 HR        LAST 30 DAYS      LAST 30 MTHS
                SCAN    MEAN    MEAN      DEV       MEAN      DEV     MEAN      DEV
  HUA FER    1.2E-14 8.9E-6   3.8E-6  -------- 3.5E-10---------------------------- RTE
      RFRM       0.0 5.0000   3.0000  -------- 6.0000   4.7434 ------------------- RTE
  SBL FER    2.2E-6  1.1E-7   4.2E-15--------- 3.2E-6 ---------------------------- RTE
      RFRM       0.0     0.0  5.0000  -------- 3.5000   3.2016 ------------------- RTE
```

```
NC,AC,SS,SBL

PARAMETER ?23

TIME PERIOD ?H
01   2.0800      17  OMIT         33  OMIT
02    1.0200     18  OMIT         34  OMIT
03    1.2E-8     19  OMIT
04    1.2E-8     20  OMIT
05    1.2E-8     21  OMIT
06    1.2E-8     22  OMIT
07    1.2E-8     23  OMIT
08    1.2E-8     24  OMIT
09    1.2E-8     25  OMIT
10    1.2E-8     26  OMIT
11    1.2E-8     27  OMIT
12   OMIT        28  OMIT
13   OMIT        29  OMIT
14   OMIT        30  OMIT
15   OMIT        31  OMIT
16   OMIT        32  OMIT

TIME PERIOD ?
```

DATEC SYSTEM EVALUATION WORKSHEET 24 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with a problem with the MAC at SRL..Honeywell is working on it..Seems we getting constant 0 voltage readings from their MAC..///RR This was found by using the MAC Self Test..///RR		6/24	0745
Honeywell advs that they have to go to SRL, and swa p out the MAC with the one from here at HUA. they will than bring the one from SRL here to attempt to repair..Appears we will conduct no testing on the system, till at least late this afternoon...////RR			0825

TECH CONTROLLER ______

OBSERVED BY ______

TEST NO.________ 1
DEV. NO.________
DATE 5-2-77 PAGE______ OF______

LOG INITIATED 5-2-77 1300 HRS

1.) 6-6-77, 1300 HRS — EPUT counters for TI-4000 FER (A&B) not resetting to zero — they reset to +0.5 volt. Could not find problem immediately - since it does not affect the test scenarios, ~~[illegible]~~ problem will be worked on part time basis. clc.

2.) 6-14-77, 0940 HRS. BEM (A) HITS observed to change erratically when monitored in MI scan. Problem was isolated to the No. 2 scanner card for channels 10-19 by card substitution. The NO. 4 scanner card (which is unused) was interchanged with the NO. 2 card & problem was resolved. The NO. 2 (bad) card will be brought down from SIBYL for problem investigation on the next trip up there. clc.

3.) 6-16-77, 1100.
Changed strapping in EPUT Command Card to 3½ minutes (See HUA Hardware Log (6-15-77) for reason) clc.

4.) 6-24-77, 0815
Was running long-term RSL during previous night — when we tried to correlate statistics file with recorder traces, it was noted that for the last 8-10 hrs, both ~~HUA~~ A & B RSL @ SBL were reading -3 dB RSL MARGIN. A MAC self test at SBL failed. Unit returned all zero's for self test voltage measurements. TJC took MAC from HUA to SBL in order to swap them out & bring MAC previously @ SBL to HUA so that we could isolate the fault.

2

TEST NO.
DEV. NO.
PAGE ___ OF

DATE 6-24-77

6-24-77 entry cont'd :—
By the time TJC reached SBL., the MAC there was operating. He was told by site personnel that when they first entered the van it was very warm. (Air conditioner had been turned off the previous evening). Since the unit now passed local self test, the MAC originally @ SBL was left there since it would have meant re-strapping to swap the two MACs. clc.

5.) 7-21-77 1600 HRS — Made changes to cabling in both vans to switch over to AR8A radio. Made same changes to BAC & BEM that were made @ HVA. (see HVA HD&R LOG - entry 9, page 3) clc

6.1.6 The DATEC Capability to Accomplish the Proposed CPMAS Functions, to Provide this Information in a Timely Manner to Achieve and Maintain the Performance Objectives of the FKV Type System

The validation tests of Appendices A through H of the Field Test Plan/Procedures document verified that all CPMAS functions were performed by the DATEC system as proposed. These functions were listed in Paragraph 6.1.1 of this section.

DATEC, being a passive monitoring system, cannot in itself achieve the performance objectives of an FKV type system. However, as was demonstrated throughout the System Simulation Scenarios, it is an effective tool in maintaining those objectives once obtained. The primary performance objective for the digital transmission system at Ft. Huachuca (which typifies the FKV system) is a bit error rate (BER) of $<1 \times 10^{-7}$. BER is derived by the BEM by processing signal-to-noise relationship at the baseband between the radio and high level MUX. Although not directly measured, this derived BER correlates well with BER measured by a BER tester. This was verified during BEM calibration operations required for site data base generation and later following the System Simulation Scenarios with the AN/FRC-162 radio before starting tests with the DR8A radio. This data is presented in Paragraph 6.1.3 of this section. This data shows correlation for BER $>1 \times 10^{-7}$. Correlation through two more orders of magnitude (1×10^{-9}) was demonstrated during final developmental testing of the BEM in-plant. This data may also be found in Paragraph 6.1.3 Derivation of BER values below 10^{-9} was obtained using the somewhat involved procedure presented in great detail in Section 3 of this report.

BEM derived BER is especially useful in early recognition of degrading bit error rate performance at the T1-4000 level because, on a single scan basis, error rates can be detected which are much lower than that which can be measured by monitoring the T1-4000 frame bit errors. With an EPUT sample time of 3-1/2 minutes for frame errors, the resolution (or lowest FER measurable) for a single scan is 5×10^{-8}. However, the resolution improves when this parameter is trended over a period of time. For example, a one hour T1-4000 FER sample has a threshold of approximately 3×10^{-9}. On a long-term basis, then, the FER parameter can be used to detect degradation of BER toward the 10^{-7} performance objective provided the rate of degradation is gradual.

Radio link problems, which if allowed to deterioriate, could cause system performance objectives to degrade beyond acceptable limits, can be detected at an early stage by observing the parameter, RSL Margin. Data taken during BEM calibration (previously mentioned in this section) indicated that at the PCM threshold,

which was at least 35 dB below the mean RSL for the Ft. Huachuca-Site Sibyl link with the AN/FRC-162 in-service, the system BER was still less than 10^{-8}. Problems involving degradation of RSL were readily identified by the technical controllers during the System Simulation Scenarios well before they reached the PCM threshold. Examples of the manner in which this parameter, RSL Margin, and the BEM derived BER were used to maintain the system performance objective follow. A clear illustration of the use of the T1-4000 parameter, FER, for this purpose does not exist because, as will be discussed in greater detail in subsequent paragraphs, the long-term trend analysis capabilities of DATEC were not utilized in this regard during field tests. The first example involves use of the BEM parameters Eye Margin and DER BER in a timely manner to resolve a developing problem before the 1×10^{-7} system BER objective was exceeded. As will be further discussed in Paragraph 6.1.14, the amber threshold for Eye Margin was changed to coincide with a DER BER of 1×10^{-9}. This was done subsequent to this scenario. The technical controller recognized the problem anyway, but the alarm flag made it more effective for later scenarios. This example, taken from an Appendix R scenario, 13 June 1977, RFI and Abnormal Interference, was previously used to illustrate a point in Paragraph 6.1.3. Reference should be made to the technical controller's comments and the display printouts.

Another good example of the use of Eye parameters to maintain good system operation is the Appendix L scenario conducted on 8 June 1977. (Refer to pages 242 through 248 in Paragraph 6.1.1). Note that the problem has been detected by Eye Margin and Hits while DER BER is still only about 10^{-9}. Note also that FER is still less than the threshold, 1×10^{-7}.

The last example illustrates use of the RSL parameter in a scenario (Appendix M, 14 June 1977) simulating a transmitter output power problem at Ft. Huachuca. In this example, the fault has been found and corrected before DER BER reached 10^{-12}.

6.1.7 The DATEC Capability to Facilitate CPMAS Procedures

CPMAS requirements address those measurements and data analysis tasks needed to support the digital communications system performance requirements. The monitoring system requirements and monitor point identification which form the baseline for the DATEC system have been discussed previously in this and other reports and will not be covered here. Instead, the emphasis will be focused on DATEC's ability to make easier, the CPMAS monitoring and measurement procedures.

The DATEC system was developed to function as a data measurement, analysis and reporting system which would aid the technical controller in assessing, correcting, and trending the performance of the digital transmission system under his control. More specifically, the DATEC system should be

PROCEDURE	DATE	TIME
M1. With power off the radio and DATEC equipment at HUA, desolder the AGC B lead coming from the radio to the Analog Scanner at Analog Scanner TB1-18. Connect a jumper wire between TB1-13 and 18. Re apply power; put equipment into operation.	6-14-77	
M2. Using attenuator installed in transmitter waveguide at HUA, introduce attenuation at the approximate rate of 1dB every 5 minutes. Record the time as each dB of attenuation is introduced.		
-1dB -2		1016
-2dB -4		1020
-3dB -6		1024
-4dB -8		
-5dB -10		
-6dB -12		
-7dB -14		
-8dB -16		
-9dB -18		
-10dB -20		
-11dB -22		
-12dB -24		
-13dB -26		
-14dB -28		
-15dB -30		
-16dB -32		
-17dB -34		
-18dB -36		
-19dB -38		
-20dB -40		
Requested to lock on B TX @ HUA @ 1027 Removed attenuation at that time. Switched back to A TX @ 1032.		
M3. Restore equipment to baseline configuration.		

CONDUCTED BY C. L. Christner 6-14-77

OBSERVED BY ______________

DATEC SYSTEM EVALUATION WORKSHEET 14 June 77, Pg # 2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All systems green..../cs		6/14	1015
Link Status indicates SBL's "A" radio recvr has gone amber, so has "B" radio recvr...cs	7/ 14 June 77		1020
Request maint go to "B" transmit radio at HUA ..cs	8/ 14 June 77		1027
SBL's RSL are good ..,Request maint check HUA's "A" Tx output power... it is OK.../cs			1030
Back on "A" radioTx at HUA...it is good... maint a dvise problem was MW amp in Tx.../cs			1032
Problem was isolated to a bad Tx at HUA..			
Displays deemed useful are: 1) LS page 1 2) LP page 1			

TECH CONTROLLER ____________

OBSERVED BY CMS

#7 14 June 77

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                     MAS                                     LINK STATUS
                              ......T1-4ØØØ......                ......RADIO......
                                 HUA        SBL                    HUA        SBL
ALARM        SW MAJOR                   .           TX PROB                .
             SW MINOR                   .           RX PROB                .
             MAJOR                      .                                  .
STATUS       TX IN SVC           A      .    A      TX IN SVC      A       .    A
             RX IN SVC           A      .    A      RX IN SVC      A       .    A
             MAINT                      .           MAINT                  .
PARAMETER    FER            <1.ØE-7   .<1.ØE-7      RX SQUELCH             .
             CRFRM                      .           RSL MARGIN   31.278    . 3Ø.ØØØ A
                                                    EYE MARGIN   13.369    . 12.573
             BER COR        NO DATA   .NO DATA      EYE AMPL    -3.8365    .-3.9355
                                                    EYE HITS        Ø.Ø    .    Ø.Ø
                                                    DER BER     1.6E-13    . 4.7E-13
                                                                          PAGE 1
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IO-ØØ5 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/1Ø26:12

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	31.278	3Ø.898	3Ø.1Ø2	1.Ø384	27.695	6.6532	--------	--------	DB
A	EYEMAR	13.362	13.369	12.877	1.Ø429	11.Ø58	3.4363	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.94172	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93532	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	5.2767	17.Ø98	18.334	46.963	--------	--------	/SC
HUA	RSLMAR	32.281	32.1Ø5	25.75Ø	7.3Ø45	29.3Ø4	2.3211	--------	--------	DB
B	EYEMAR	5.9534	5.9534	6.679Ø	3.1434	7.7781	2.8628	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	Ø.9966	--------	Ø.9938	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9955	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	3.2613	21.ØØ3	4.Ø643	4.5525	--------	--------	/SC
SBL	RSLMAR	3Ø.ØØØ	34.493	33.313	1.3472	38.153	1.3633	--------	--------	DB
A	EYEMAR	12.573	13.931	13.452	.35227	13.175	.53384	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9985	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	16.238	51.564	2.2326	3.5727	--------	--------	/SC
SBL	RSLMAR	27.545	31.668	34.367	.85813	33.564	1.3133	--------	--------	DB
B	EYEMAR	12.8ØØ	12.3ØØ	13.396	.8356Ø	12.925	1.18Ø9	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9934	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø3817	.23112	.77629	2.4187	--------	--------	/SC

#8 14 June 77

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MAC-3-01-02                  LINK STATUS                         TIME 165/1430:04
                        ......T1-4000......                      ......RADIO......
                          HUA            SBL                       HUA         SBL
ALARM       SW MAJOR                .                TX PROB               .
            SW MINOR                .                RX PROB               .
            MAJOR                   .                                      .
STATUS      TX IN SVC     A         .     A          TX IN SVC     B       .     A
            RX IN SVC     A         .     A          RX IN SVC     A       .     A
            MAINT                   .                MAINT                 .
PARAMETER   FER           1.0E-7    .<1.0E-7         RX SQUELCH            .
            CRFRM                   .                RSL MARGIN  30.778    . 38.100
                                                     EYE MARGIN  13.369    . 12.459
            BER COR       NO DATA   .NO DATA         EYE AMPL    -3.8065   .-3.9355
                                                     EYE HITS     0.0      .  0.0
                                                     DER BER     1.6E-13   . 5.5E-13
                                                                         PAGE 1
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MAC-3-01-02 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/1431:10

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA A	RSLMAR	30.778	30.881	30.102	1.0334	27.695	6.6532	--------	--------	DB
	EYEMAR	13.369	13.369	12.877	1.0429	11.053	3.4563	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.94172	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	.93539	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	5.2767	17.098	18.334	46.063	--------	--------	/SC
HUA B	RSLMAR	32.[illegible]	32.093	25.750	7.3345	29.394	2.3211	--------	--------	DB
	EYEMAR	5.9534	5.9534	3.6724	3.1434	7.7781	2.8028	--------	--------	DB
	RSLAVL	1.0001	1.0000	0.9966	--------	0.9933	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9955	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	3.2610	21.003	4.0603	4.8525	--------	--------	/SC
SBL A	RSLMAR	38.100	34.493	33.613	1.3372	33.153	1.3033	--------	--------	DB
	EYEMAR	12.459	13.441	13.459	.85297	13.175	.53334	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9985	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	13.238	51.564	2.2326	3.5727	--------	--------	/SC
SBL	RSLMAR	35.563	31.663	34.967	.85313	33.564	1.3183	--------	--------	DB
	EYEMAR	12.800	12.800	13.396	.33563	12.925	1.1839	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0500	1.0000	--------	0.9954	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.40017	.23112	.77629	2.4187	--------	--------	/SC

evaluated by its ability to accomplish performance assessment, fault isolation and trend analysis of a digital transmission system for it is in the accomplishing of these objectives that the net worth of the system can be judged for making the CPMAS procedures easier.

The performance assessment task requires the technical controller to determine the operating communications system characteristics including some measure of system and equipment operating margin. Using only standard measuring equipment, the technical controller would be able to measure the receiver automatic gain control voltage and from that determine the received signal level and operating or fade margin. He would not be able to make any assessment of the digital multiplexer operating performance other than to verify that there are presently no alarm conditions. The DATEC system accomplishes performance assessment by measuring system and equipment performance indicators thereby making easier the technical controller's job. In addition to assuming the RSL measurement task already discussed, the DATEC system also gathers performance data relative to the quality of the received signal, and its operating margin, by analyzing the radio baseband signal for values of eye margin, eye amplitude, and derived system bit error rate. Multiplexer performance is measured by monitoring the frame error rate and resynchronization activity on both the high and low level multiplexer. Using this information the technical controller can function in the capacity of a nodal controller, one who is responsible for the proper operation of multiple sites, both manned and unmanned. The usefulness and effectiveness of this approach was demonstrated during the scenario evaluations wherein the technical controller looked first to the system overview display to notify him of degraded conditions within his nodal area. The fact that only two sites (one link) were involved in the testing in no way diminishes the observed effectiveness of the system overview display. Time after time as shown on the worksheets in Appendices U' (20 June), L (20 June), and R (21 June) the system overview was judged effective in alerting the technical controller to system performance degradations. Once alerted to a link problem the technical controller moved to the link status display where he was provided alarm, status and parameter information directly usable in determining the source of the problem. Once again, the technical controller worksheets attest to the usefulness of the link status displays in Appendices L (14 June), M (14 June), and DD (9 June).

There can be little doubt, then, that the DATEC system facilitates CPMAS procedures in performance assessment measurements by enabling the technical controller to function as a nodal controller thereby assuming the responsibility of accomplishing performance assessment for a number of sites.

DATEC SYSTEM EVALUATION WORKSHEET 20 June 77 Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with systems green, and data a ttached..////RR	~~1x~~ 1-4/20 June 77	6/20	0845
Overview display indicates the "A " mux a t HUA is amber...Letting another scan go thru before doing anything...////RR	5/20 June 77		0846
Link status display indicates the problem with the "A" mux is FER....Req uested maint switch HUA to the "B" recv mux..///RR	6/20 June 77		0850
On "B" mux, recv at HUA, and display indicates this is also ba d.....However, this could be old data so have to wait for another sca n before we can decide if there is any problem with the "B" mux....///RR	7/20 June 77		0857
"B" mux has now cleared, and service appearrs to be restored....Advised maint to check the "A" mux, Recv at HUA.....////RR	8/20 June 77		0900
Problem isolated to bad Recv "A " mux at HUA.. maint advsd problem with the "Recv time base"... System back on the "A " mux A TT...///RR			0913
Displays used.....			
1. System overview			
2. Link status Pg # 1 .			
Note: The length of time required to determine if the "B" mux was good (after putting it on line) was lengthy, due to the scanning sequence/time...////RR			

TECH CONTROLLER R

OBSERVED BY CMS

DATEC SYSTEM EVALUATION WORKSHEET 20 June 77, Pg # 3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems Green.../////RR		6/20	1030
Display shows amber on the T14000 and T1WB1 at HUA..///RR (Overview)	11/20 June 77		1059
Both above amber conditions cleared, and overview shows no problem...////RR			1103
Based on above, checked link status (suspected recvr squelch), and this showed the "B" recvr in-service at HUA...////RR	12/20 June 77		1104
LP indicated "A" radio was good...no indication as to why the switch to "B" was made...////RR Also requested maint. switch the system back to the "A" Recvr... They advsd it would not siwtch..//RR	13/20 June 77		1106
Requested maint at HUA check the "A" Rcvr..and they indicated they had a problem with it..//RR			1111
Maint advsd they had a noisy "A" Recvr..///RR all systems normled..////RR			1132
Problem isolated to noisy "A " Recvr at HUA...			
Displays usefyl////			
1. Overview			
2. LP Pg # 1			
Comment: Page 14 to day indicates the Rx was bad ("A") a t HUA fifteen minutes after the actual problem started. cant explain the long delay../cs	14/2 0 June 77		
TECH CONTROLLER Cms			
OBSERVED BY R			

DATEC SYSTEM EVALUATION WORKSHEET

21 June 1977/pg #3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
systems green...///RR		6/21	1300
System overview show amber on the REC "A" mux and T1WB1..../ph	#5/21 June 1977		1310
Request maint switch from "A" to "B" rec mux at HUA....and check out the "A" mux for framing error tbls..../ph			1312
Maint a dvise that "A" mux is good, when we shifted to the "B" mux all amber conditions cleared...advised maint to switch to "A" mux. maint advise possible cause of framing errors was a clean-up team working in and around the mux may have jarred something..../ph			1315
SBL "B" radio in amber on system overview, reason unknown..asked SBL to check his radio,../ph	6/7/21 June 1977		1316
Link performance indicates both eye margins are low on SBL rec..../ph			1320
Requested that SBL check out for any interference on his rec.../ph			1325
Maintenance advises that he is send the interference on his transmitter, he switched to the "B" transmitte r while he is working on the "A"...../ph			1328
Dis lays used: System overview Link Status Link performance (Most Help)			

TECH CONTROLLER ________

OBSERVED BY ________

DATEC SYSTEM EVALUATION WORKSHEET 14 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All Sy stems are green and/or normal.../// ./cs	1-4/ 14 June 77	6/14	0741
Displays indicate the RSL margin at HUA is beginning to degrade...///RR			0831
System at HUA switched to the "B" recvr..No indication as to why...///RR	5/14 June 77		0839
Attempted to manually switch the recv at HUA back to the "A" recvr...unable to do this...///RR			0845
Locked HUA Recv on the "B" recvr...Requested maint check out the "A" recvr..See RSL margin degraded, and also see the Eye margin on the "A " recvr degrading...////RR	5-6/14 June 77		0854
Maint advsd they had a bad IF int the "A" Recv.. The "A" recvr now back on line and fivers...///RR			0910
Problem resolved::::Bad IF within the "A " Recvr at HUA...////RR			
Following displays were useful in tracing the problem.... 1....LS Pg # 1 2....LP Pg # 1			
NOTE: Displays indicating faulty Eye data on "A" ra dio at SBL...Turned over to maint to check the system...///RR			0925
NOTE: Honeywell advsd appears to be a bad relay card in the EPUT scanner at SBL.. They swapped with a spare..///RR//Eye hits clear, however now showing bad Eye Amplitude..Honeywell still checking ...///RR			0953
Problem cleared by Honeywell...///cs			1015
TECH CONTROLLER ______			
OBSERVED BY CMS			

DATEC SYSTEM EVALUATION WORKSHEET 14 June 77, Pg # 2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All systems green..../cs		6/14	1015
Link Status indicates SBL's "A" radio recvr has gone amber, so has "B" radio recvr...cs	7/ 14 June 77		X1020
Request maint go to "B" transmit radio at HUA ..cs	8/ 14 June 77		1027
SBL's RSL are good ..,Request maint check HUA's "A" X Tx output power... it is OK.../cs			1030
Back on "A" radioTx at HUA...it is good... maint a dvise problem was MW amp in Tx.../cs			1032
Problem was isolated to a bad Tx at HUA..			
Displays deemed useful are: 1) LS page 1 2) LP page 1			
TECH CONTROLLER ________			
OBSERVED BY cms			

DATEC SYSTEM EVALUATION WORKSHEET 9 June '77 Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with systems da ta atchd..//RR	1-4/9 June 77	6/9	0900
CRT displa y indica tes Ma jor Alarm, T1W B1 at HUA and SBL a ppear not to be passing traffic.//cs	5-/9 June 77		0918
Check link status of T1WB1 andget alarm indication, check maint voltages at HUA and SBL appear good./cs	6/ 9 June		0925
Link Sta tus Now indicates bad recv on T1WB1 at HUA...SBL recv shows excellent.//cs	7/ 9June		0935
Link Performance assessment indicates good T1-4000,.. in house loopback on T1WB1 is good./cs	8/ 9June 77		0938
Request loop back of SBL's T1WB1,Checks GOOD... Suspect bad recv channel in HUA's T1-4000 or bad tra nsmit channel in SBL's T1-4000. Turn over in house problem to maintenane first.//cs			0942
Maintenance informs that there was a bad recv card in T1-4000, wa s replaced, framing error rate ba ck to normal..//cs	9/ 9June 77		0951
Problem isolated to be bad T1-40000 RCV card. /cs			

TECH CONTROLLER CS

OBSERVED BY

Next in the list of CPMAS requirements is the ability to perform fault isolation. This task is currently performed by the technical controller wherein he uses equipment alarms to isolate failures. This procedure limits the technical controller to addressing only those fault conditions which result in an equipment alarm and places the isolation of degraded equipment and system performance, with accompanying intermittent problems, beyond the reach of the technical controller using standard measuring equipment and techniques.

The DATEC system provides the technical controller with alarm information thereby enabling him to perform fault isolation within his nodal responsibility. It also provides him with parameter information thereby enhancing not only his fault isolating capability, but also providing him the ability to effectively execute degradation isolation. The usefulness and effectiveness of fault isolation was demonstrated throughout the system scenario evaluation. Appendices N, P and U, excerpts of which appear throughout this section, illustrate the technical controller utilization of the DATEC system in resolving system and equipment problems. An illustration of the effectiveness of identifying and correcting system degradations before they became system failures is shown in Appendix L (14 June) where technical controller corrective action was initiated prior to the point at which the degradation would have been identifiable as a system fault. The timely identification and resolution of system faults and degradations, as evidenced by the scenario results, serves to confirm the ability of the DATEC system to facilitate CPMAS procedures by making easier and more effective the technical controller's job of fault and degradation isolation.

The inclusion of trend analysis as a CPMAS requirement is to be viewed as an extension of the performance assessment function already discussed, for it is through long term trending of key performance assessment parameters that DATEC could make possible a reduction in manpower and the unmanning of sites. Looking first at the counterpart of trending in the field today, we see that while attempts have been made in the past to collect long term data, the data has often been regarded as highly suspect as to its validity and usefulness mainly because of the man in the loop which means that the data collection and reduction is not always adequate and sufficient due to human errors. DATEC field testing and scenario evaluation did not address the question of long term trend analysis in great detail, but one scenario (Appendix S, Special RSL Long Term Test) was included to specifically illustrate at least some aspects of the utility of long term (in this case - hours) trend analysis. Data from this scenario is presented in graph form in Figures 6-1 through 6-6 . This data shows at a glance the correlation and interaction

PROCEDURE	DATE	TIME
L1. At HUA, connect attenuators (X1 and X10) between Equalizer and IF in RX A as shown in Figure L-1.	6-14-77	0750
L2. With power off the radio and DATEC equipment at HUA, do solder the AGC A lead coming from the radio to the Analog Scanner at Analog Scanner TB1-13. Connect a jumper wire between TB1-13 and 18. Reapply power; put equipment into operation.		0751
L3. Introduce attenuation at the approximate rate of ~~one~~ two dB every 5 minutes. Do not drop below squelch threshold. Record time when each addition of attenuation is made:		
STARTING WITH 15 dB: -1dB -2		0755
-2dB -4		0800
-3dB -6		0805
-4dB -8		0810
-5dB -10		0815
-6dB -12		0820
-7dB -14		0825
-8dB -16		0830
-9dB -18		0840
-10dB -20		
-11dB -22		0850
Requested to check A RX at 0854. Took attenuation out at that time. -12dB -24		
-13dB -26		
-14dB -28		
-15dB -30		
-16dB -32		
-17dB -34		
-18dB -36		
-19dB -38		
-20dB -40		
-21dB		
-22dB		
-23dB		
-24dB		
-25dB		
L4.) Restore equipment to base line condition at completion of test.		

CONDUCTED BY C L Christner 6-14-77

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DATEC SYSTEM EVALUATION WORKSHEET 14 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All Sy stems are green and/or normal...///./cs	1-4/ 14 June 77	6/14	0741
Displays indicate the RSL margin at HUA is beginning to degrade...///RR			0831
System at HUA switched to the "B" recvr..No indication as to why...///RR	5/14 June 77		0839
Attempted to manually switch the recv at HUA back to the "A" recvr...unable to do this...///RR			0845
Locked HUA Recv on the "B" recvr...Requested maint check out the "A" recvr..See RSL margin degraded, and also see the Eye margin on the "A " recvr degrading...////RR	5-6/14 June 77		0854
Maint advsd they had a bad IF int the "A" Recv.. The "A" recvr now back on line and fivers...///RR			0910
Problem resolved::::Bad IF within the "A " Recvr at HUA...////RR			
Following displays were useful in tracing the problem.... 1....LS Pg # 1 2....LP Pg # 1			
NOTE: Displays indicating faulty Eye data on "A" ra dio at SBL...Turned over to maint to check the system...///RR			0925
NOTE: Honeywell advsd appears to be a bad relay card in the EPUT scanner at SBL.. They swapped with a spare..///RR//Eye hits clear, however now showing bad Eye Amplitude..Honeywell still checking ...///RR			0953
Problem cleared by Honeywell...///cs			1015
TECH CONTROLLER R OBSERVED BY CMS			

```
MAS                                   SYSTEM OVERVIEW             TIME  165/Ø742:19
              HUA          SBL
RADIO A        .            .
      B        .            .
MUX SW         .            .
     A         .            .
     B         .            .
CY1Ø4          .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
TIWB1          .            .
               .            .
               .            .
               .            .
          ......................
TELEMETRY.          .           .
          .         .           .
SITE      .         .           .
```

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```
AS-2                              LINK STATUS                        TIME  165/Ø743:11
                            ......T1-4ØØØ......                 ......RADIO......
                                HUA          SBL                    HUA         SBL
   ALARM       SW MAJOR                .                 TX PROB              .
               SW MINOR                .                 RX PROB              .
               MAJOR                   .                                      .
   STATUS      TX IN SVC        A      .      A          TX IN SVC      A     .     A
               RX IN SVC        A      .      A          RX IN SVC      A     .     A
               MAINT                   .                 MAINT                .
   PARAMETER   FER           <1.ØE-7   .<1.ØE-7          RX SQUELCH           .
               CRFRM                   .                 RSL MARGIN  29.487   . 4Ø.556
                                                         EYE MARGIN  13.369   . 12.914
               BER COR       NO DATA   .NO DATA          EYE AMPL   -8.8Ø65   .-9.Ø741
                                                         EYE HITS       Ø.Ø   .    Ø.Ø
                                                         DER BER    1.6E-13   . 3.ØE-13
                                                                            PAGE 1
```

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MAS LINK STAT[illegible] TIME 165/07 14:23

.......[illegible]Y-104....... ......T1WB1......

		HUA	SBL			HUA	SBL
ALARM	SERVICE	.		OFFICE		.	
		.				.	
		.				.	
	REMOTE	.				.	
		.				.	
		.				.	
STATUS	MAINT	.		MAINT		.	
		.				.	
		.				.	
PARAMETER	CHANNEL	.		FER	<1.0E-6	.	<1.0E-6
		.		REFRAME		.	
SITE	ENTRY	.					
ALARMS	FIRE	.					
	AC PWR	.					
	BATTERY	.					
	W.A. PR	.					
	W.G. HV	.					
	FLOOD	.					

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PAGE 2

10-007 L[illegible]K PERFORMANCE ASSE[illegible]NT - RADIOS TIME 165/0745:30

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA A	RSLMAR	29.437	2[illegible]36	30.346	.66225	[illegible]449	6.9[illegible]54	--------	--------	DB
	EYEMAR	13.369	1[illegible]28	12.647	1.7969	[illegible]908	3.5695	--------	--------	DB
	RSLAVL	1.0000	1[illegible]00	1.0000	-----	[illegible].454	--------	--------	--------	RATE
	EYEAVL	1.0000	1[illegible]00	0.9933	-----	[illegible]2835	--------	--------	--------	RATE
	EYEHIT	0.0	[illegible].0	5.3825	17.073	19.684	49.2[illegible]	--------	--------	/SC
HUA B	RSLMAR	27.843	25[illegible]79	25.776	7.4342	30.239	1.9699	--------	--------	DB
	EYEMAR	5.1807	5.[illegible]24	6.9377	3.8304	7.3904	3.[illegible]	--------	--------	DB
	RSLAVL	1.0004	1.[illegible]00	0.9934	--------	0.9939	--------	--------	--------	RATE
	EYEAVL	1.0001	1.0[illegible]10	.98667	--------	0.9965	--------	--------	--------	RATE
	EYEHIT	0.0	.01[illegible]33	11.067	24.393	3.3601	4.5277	--------	--------	/SC
SBL A	RSLMAR	40.556	38.[illegible]34	38.799	1.2932	38.091	1.4336	--------	--------	DB
	EYEMAR	12.914	13.170	13.520	.34634	13.142	.54955	--------	--------	DB
	RSLAVL	1.0004	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0003	1.0000	1.0000	--------	0.9983	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	8.2155	37.073	1.7443	3.1094	--------	--------	/SC
SBL B	RSLMAR	33.636	32.978	34.016	.21702	33.520	1.3755	--------	--------	DB
	EYEMAR	13.482	13.445	13.438	.83309	12.876	1.0276	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0003	--------	--------	--------	RATE
	EYEAVL	1.0003	1.0000	1.0003	--------	0.9933	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.03434	.22675	.34547	2.5253	--------	--------	/SC

IO 008 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/0747:45

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	EYEVOL	-3.7600	-3.7750	-3.7312	.33837	-4.0059	.36952	--------	--------	VLTS
A	RXSOH	0.0	0.0	6.0000	--------	3.0000	--------	--------	--------	RTE
HUA	EYEVOL	-4.5400	-4.5450	-4.3741	.40326	-4.2676	.27680	--------	--------	VLTS
B	RXSOH	0.0	0.0	5.0000	--------	12.000	--------	--------	--------	RTE
HUA	LNKAVL	1.0000	1.0000	.98433	--------	0.9988	--------	--------	--------	RTE
SBL	EYEVOL	-3.8000	-3.7775	-3.6605	.27574	-3.7633	.06849	--------	--------	VLTS
A	RXSOH	0.0	0.0	1.0000	--------	14.000	--------	--------	--------	RTE
SBL	EYEVOL	-3.7500	-3.7533	-3.6788	.27160	-3.7984	.11742	--------	--------	VLTS
B	RXSOH	0.0	0.0	1.0000	--------	9.0000	--------	--------	--------	RTE
SBL	LNKAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE

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IO-005 LINK PERFORMANCE ASSESSMENT - C1-4000 TIME 165/0748:47

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.0E-15	3.0E-16	2.9E-9	--------	5.5E-3	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	7.0000	--------	2.3000	2.5710	--------	--------	RTE
	CR/SOH	0.0	0.0	4.0000	--------	1.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	2.0000	--------	9.2000	--------	--------	--------	RTE
HUA	FER	1.0E-15	3.3E-17	--------	--------	2.6E-19	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	6.0000	--------	2.0000	2.2238	--------	--------	RTE
	CR/SOH	0.0	0.0	4.0000	--------	1.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	3.0000	--------	1.0000	--------	--------	--------	RTE
SBL	FER	1.0E-15	2.7E-16	3.9E-6	--------	5.3E-7	--------	--------	--------	RTE
A	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	4.0000	--------	1.6000	2.1541	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	4.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	5.0000	--------	--------	--------	RTE
SBL	FER	5.2E-10	5.2E-11	1.2E-11	--------	1.3E-7	--------	--------	--------	RTE
B	FERAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RTE
	CRFRM	0.0	0.0	5.0000	--------	1.5000	1.9135	--------	--------	RTE
	CR/SOH	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE
	CR/HIT	0.0	0.0	0.0	--------	3.0000	--------	--------	--------	RTE

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AS-2 LINK PERFORMANCE ASSESSMENT - T1WB1 TIME 165/0749:50

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	FER	1.2E-14	4.0E-15	5.0E-15	--------	4.9E-6	--------	--------	--------	RTE
	RFRM	0.0	0.0	8.0000	--------	4.5000	4.0311	--------	--------	RTE
SBL	FER	1.2E-14	3.6E-15	4.7E-5	--------	1.0E-5	--------	--------	--------	RTE
	RFRM	0.0	0.0	7.0000	--------	3.1000	3.4771	--------	--------	RTE

IQ-006 MAINTENANCE VOLTAGES - HUA TIME 165/0750:39

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	T1WB1+15	15.5	G	16.5	15.7	15.0	14.2	13.5	15.5	.043	153/0907
02	T1WB1+12	12.4	G	13.2	12.6	12.0	11.4	10.8	12.4	.012	153/0907
03	T14000+5	4.96	G	5.50	5.25	5.00	4.75	4.50	4.95	.007	153/0907
04	T14000-6	-6.08	G	-5.40	-5.70	-6.00	-6.30	-6.60	-6.08	.002	153/0907
05	RADIO+24	24.0	G	26.4	25.2	24.0	22.8	21.6	23.9	.030	153/0907
06	RADIO-20	-19.9	G	-18.0	-19.0	-20.0	-21.0	-22.0	-19.9	.014	153/0907

BEM-3-M0-I2 MAINTENANCE VOLTAGES - SBL TIME 165/0751:36

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	T1WB1+15	15.1	G	16.5	15.7	15.0	14.2	13.5	15.1	.069	153/0911
02	T1WB1+12	12.3	G	13.2	12.6	12.0	11.4	10.8	12.3	.010	153/0911
03	T14000+5	4.95	G	5.50	5.25	5.00	4.75	4.50	4.94	.004	153/0911
04	T14000-6	-6.06	G	-5.40	-5.70	-6.00	-6.30	-6.60	-6.06	.015	153/0911
05	RADIO+24	24.1	G	26.4	25.2	24.0	22.8	21.6	24.1	.012	153/0911
06	RADIO-20	-20.1	G	-18.0	-19.0	-20.0	-21.0	-22.0	-20.1	.014	153/0911

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IQ-ØØ5 LINK STATUS TIME 165/Ø331:34

		......T1-4ØØØ......			......RADIO......	
		HUA	SBL		HUA	SBL
LARM	SW MAJOR	.		TX PROB	.	
	SW MINOR	.		RX PROB	.	
	MAJOR	.			.	
STATUS	TX IN SVC	A .	A	TX IN SVC	A .	A
	RX IN SVC	A .	A	RX IN SVC	A .	A
	MAINT	.		MAINT	.	
PARAMETER	FER	<1.ØE-7	.<1.ØE-7	RX SQUELCH	.	
	CRFRM	.		RSL MARGIN	27.39Ø	. 36.7ØØ
				EYE MARGIN	13.369	. 13.331
	BER COR	NO DATA	.NO DATA	EYE AMPL	-8.9677	.-8.9355
				EYE HITS	Ø.Ø	. Ø.Ø
				DFR BER	1.6E-13	. 8.4E-14

PAGE 1

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/Ø333:Ø3

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	27.39Ø	27.794	3Ø.26Ø	.79673	27.449	6.9354	--------	--------	DB
A	EYEMAR	13.369	12.876	12.624	1.7998	1Ø.9Ø8	3.5695	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.93454	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	Ø.9935	--------	.92835	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	5.3325	17.Ø73	19.684	49.466	--------	--------	/SC
HUA	RSLMAR	28.835	29.199	25.552	7.3253	3Ø.232	1.9649	--------	--------	DB
B	EYEMAR	5.567Ø	5.6153	6.6551	3.7117	7.89Ø4	3.ØØ45	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	Ø.9935	--------	Ø.9939	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	.93667	--------	Ø.9266	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	11.Ø68	24.398	3.3641	4.5271	--------	--------	/SC
SBL	RSLMAR	36.7ØØ	38.25Ø	33.814	1.2952	33.391	1.4336	--------	--------	DB
A	EYEMAR	13.482	13.685	13.511	.84534	13.142	.54955	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9983	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	8.2155	37.Ø73	1.7443	3.199	--------	--------	/SC
SBL	RSLMAR	32.75Ø	33.371	33.995	.92691	33.52Ø	1.3755	--------	--------	DB
	EYEMAR	14.421	14.421	13.422	.82657	12.376	1.2276	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9983	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø3431	.22675	.84542	2.5263	--------	--------	/SC

#6 14 June 77

LINK STATUS — TIME 165/0339:46

		T1-4000 HUA	T1-4000 SBL		RADIO HUA	RADIO SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB		
	MAJOR					
STATUS	TX IN SVC	A	A	TX IN SVC	A	A
	RX IN SVC	A	A	RX IN SVC	B	A
	MAINT			MAINT		
PARAMETER	FER	<1.0E-7	<1.0E-7	RX SQUELCH		
	CRFRM			RSL MARGIN	20.094	37.200
				EYE MARGIN	6.0500	13.482
	BER COR	NO DATA	NO DATA	EYE AMPL	-9.0741	-8.9355
				EYE HITS	0.0	0.0
				DER BER	8.5E-13	1.4E-13

PAGE 1

C-1-18-23 MAINTENANCE VOLTAGES - HUA TIME 165/0347:55

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
1	T1WB1+15	15.6	G	16.5	15.7	15.0	14.2	13.5	15.5	.043	153/0907
2	T1WB1+12	12.4	G	13.2	12.6	12.0	11.4	10.8	12.4	.012	153/0907
3	T14000+5	4.96	G	5.50	5.25	5.00	4.75	4.50	4.95	.007	153/0907
4	T14000-6	-6.08	G	-5.40	-5.70	-6.00	-6.30	-6.60	-6.08	.002	153/0907
5	RADIO+24	24.0	G	26.4	25.2	24.0	22.8	21.6	23.9	.030	153/0907
6	RADIO-20	-19.9	G	-18.0	-19.0	-20.0	-21.0	-22.0	-19.9	.014	153/0907

-1-08-10 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 165/0851:59

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	25.116	27.531	30.260	.79673	27.449	6.9354	-------	-------	DB
A	EYEMAR	6.3500	12.687	12.624	1.7938	10.908	3.5695	-------	-------	D
	RSLAVL	1.0000	1.0000	1.0000	--------	.93454	-------	-------	-------	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	--------	[illegible]	-------	-------	-------	[illegible]

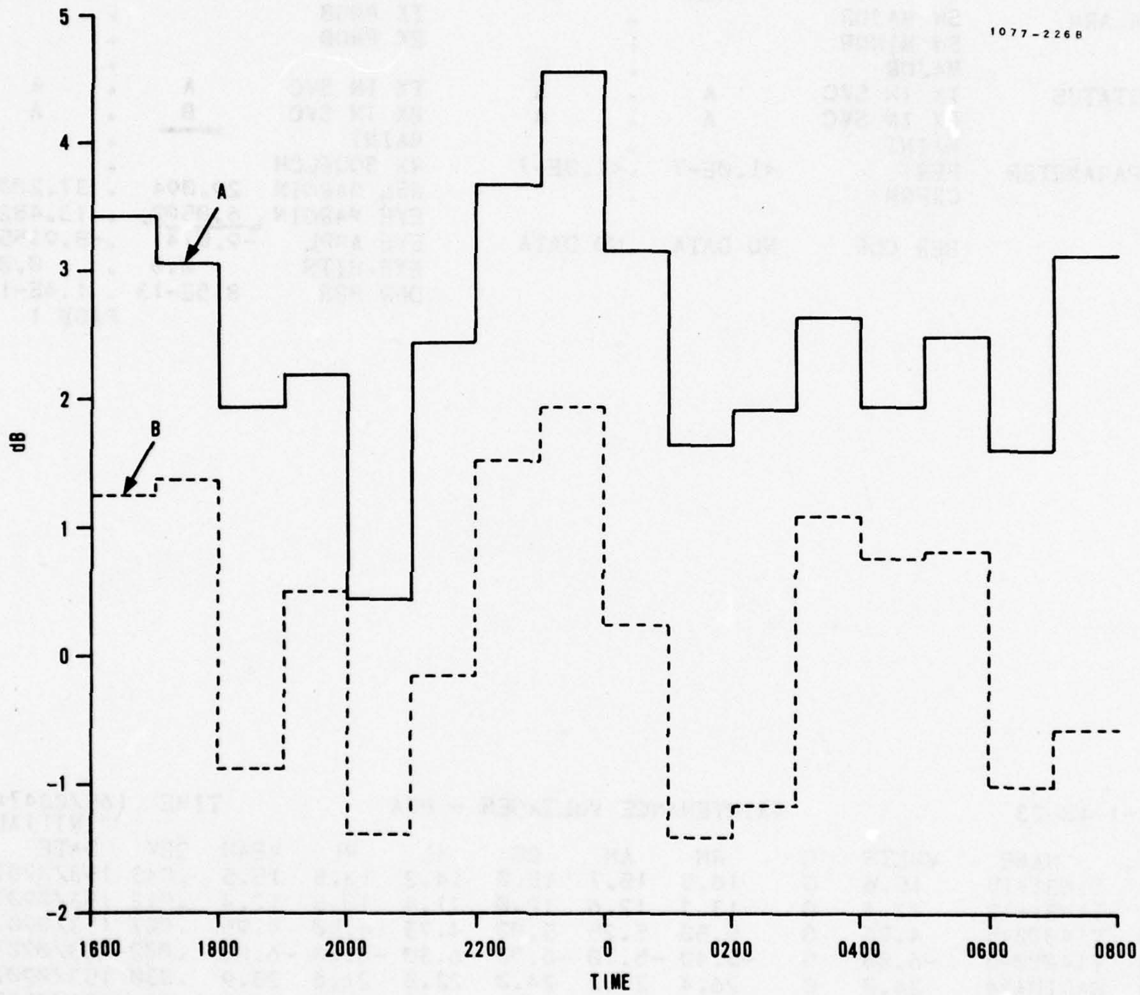


FIGURE 6-1. RSL MARGIN

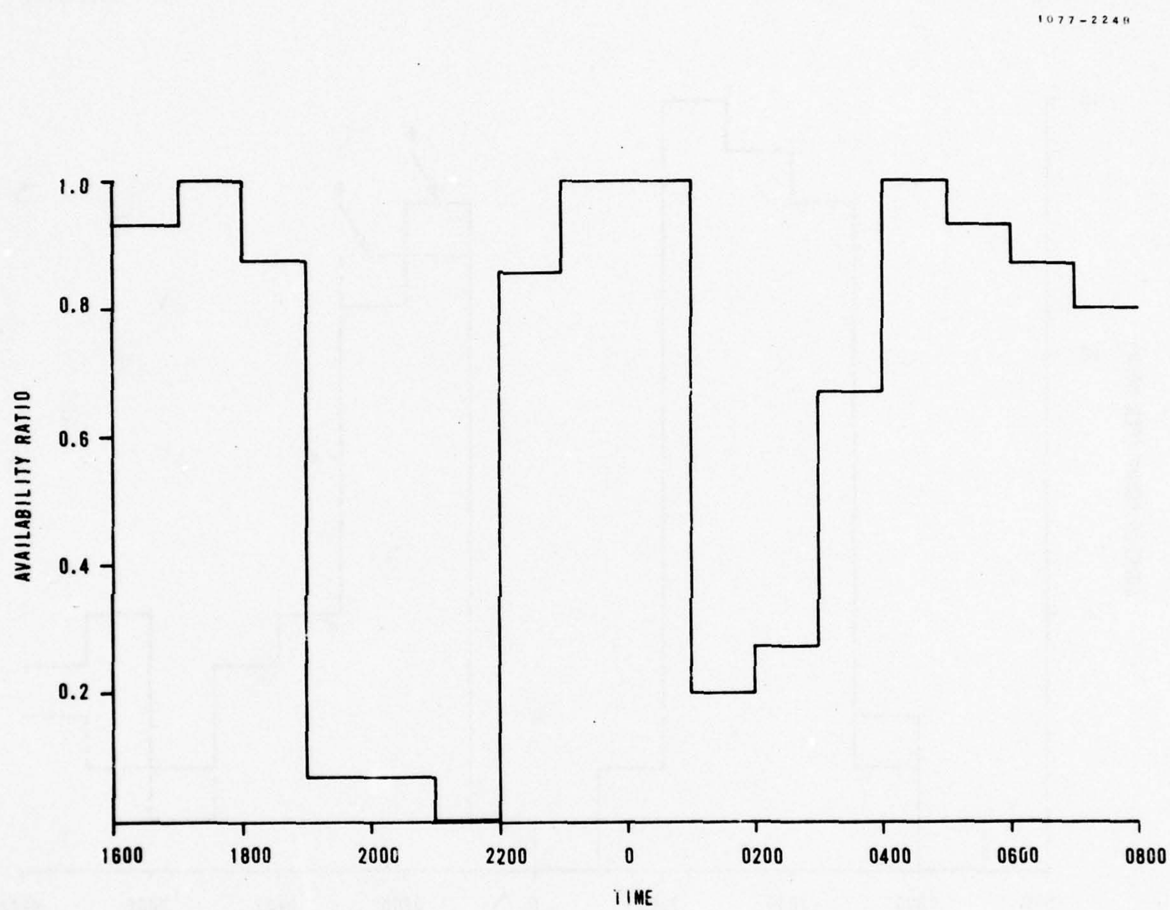


FIGURE 6-2. LINK AVAILABILITY

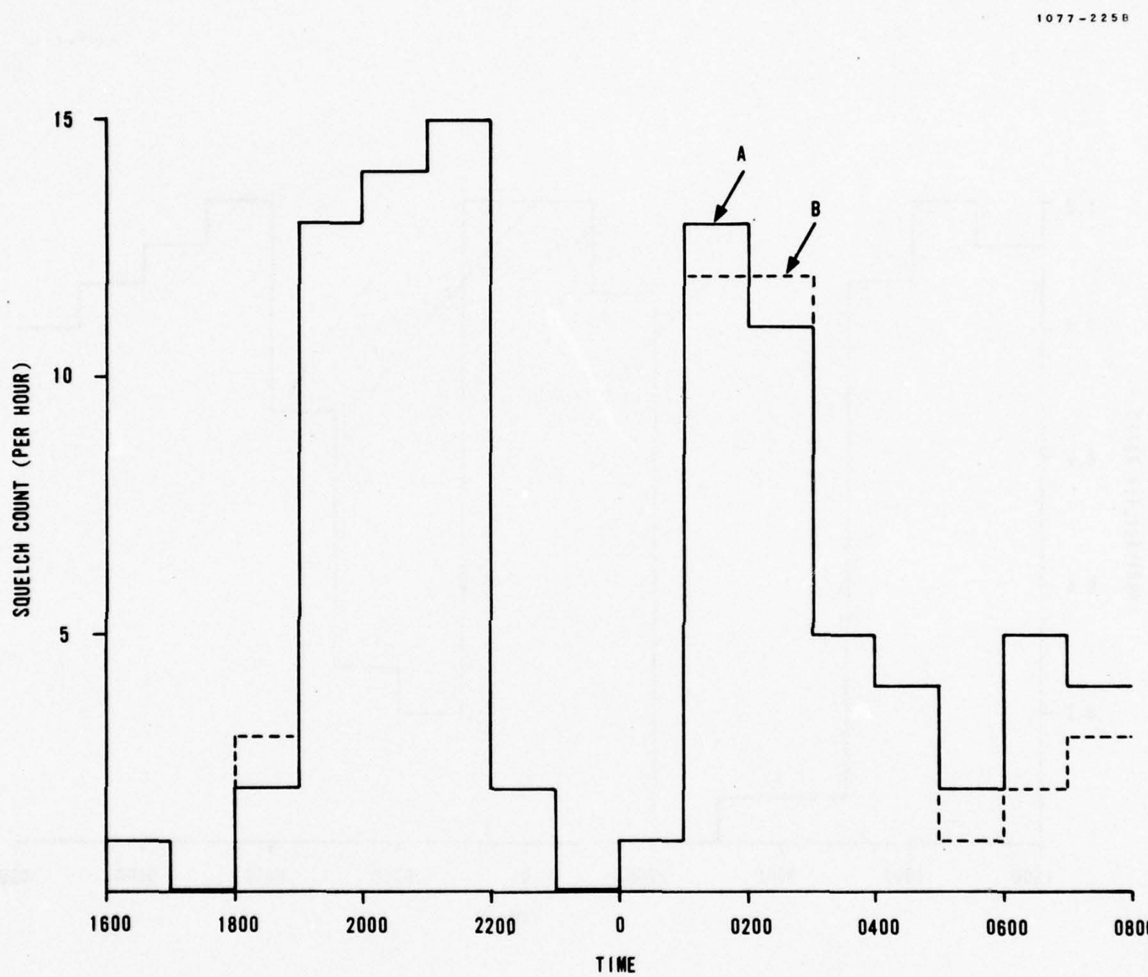


FIGURE 6-3. RECEIVER SQUELCH

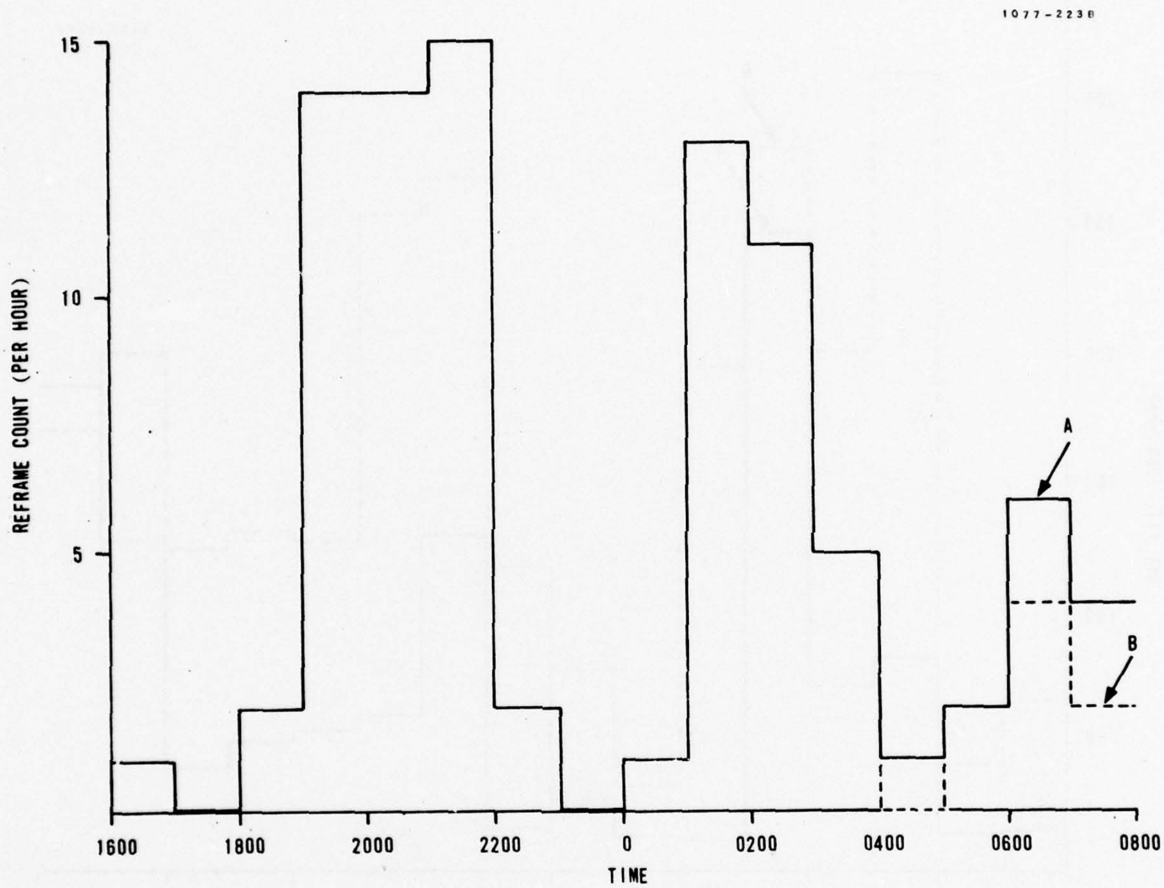


FIGURE 6-4. CONTROL REFRAMES (T1-4000)

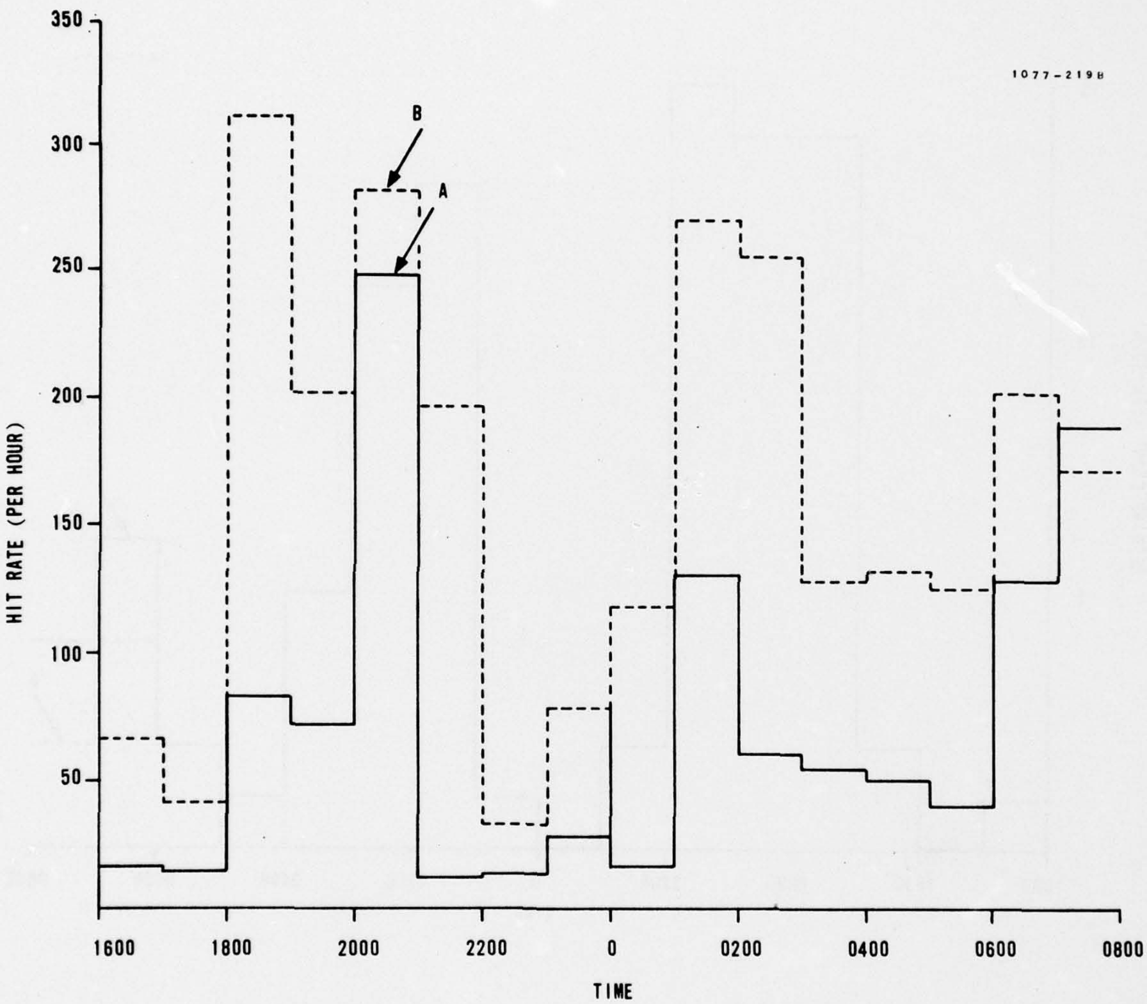


FIGURE 6-5. EYE HITS

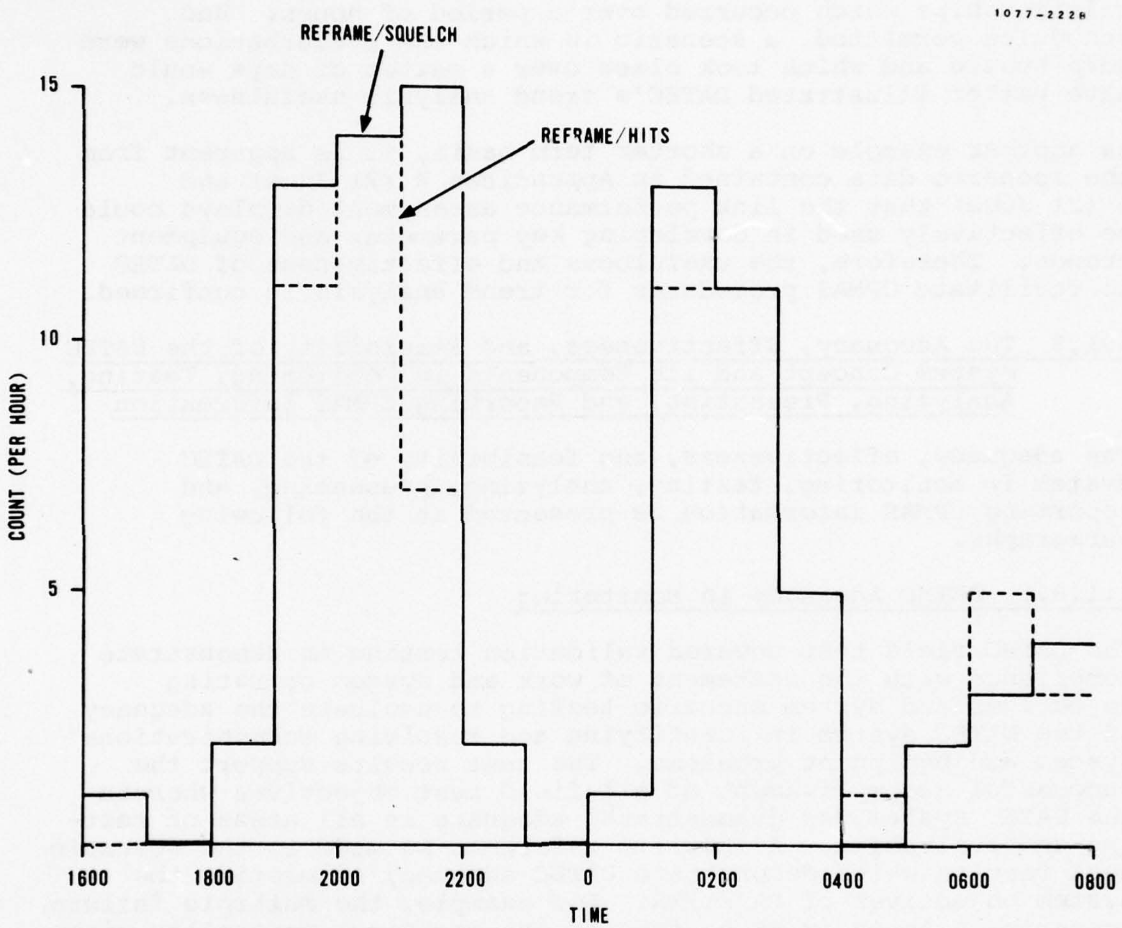


FIGURE 6-6. REFRAME CORRELATION COUNT

of key parameters over the 16 hour period the scenario was conducted. Even this scenario does not fully exploit the potential advantages of long term trending relative to manpower requirements. It does serve to point out clearly the cause and effect relationships which occurred over a period of hours. Had schedules permitted, a scenario in which the perturbations were more subtle and which took place over a matter of days would have better illustrated DATEC's trend analysis usefulness.

As another example on a shorter term basis, it is apparent from the scenario data contained in Appendices R (21 June) and N (21 June) that the link performance assessment displays could be effectively used in developing key parameter and equipment trends. Therefore, the usefulness and effectiveness of DATEC to facilitate CPMAS procedures for trend analysis is confirmed.

6.1.8 The Adequacy, Effectiveness, and Feasibility of the DATEC System Concept and its Components in Monitoring, Testing, Analyzing, Presenting, and Reporting CPMAS Information

The adequacy, effectiveness, and feasibility of the DATEC system in monitoring, testing, analyzing, presenting, and reporting CPMAS information is presented in the following paragraphs.

6.1.8.1 DATEC Adequacy in Monitoring

The DATEC field test covered validation testing to demonstrate compliance with the statement of work and system operating objectives and system scenario testing to evaluate the adequacy of the DATEC system in identifying and resolving communications system and equipment problems. The test results support the successful accomplishment of all field test objectives wherein the DATEC system was demonstrated adequate in all areas of testing and evaluation. A specific reference is made to the scenario test results which demonstrate DATEC adequacy in meeting the system objectives of PA/FI/TA. For example, the multiple failure scenario in Appendix EE confronted the technical controller with a cross section of problem types addressing both hard equipment failures and more subtle equipment degradation. The technical controllers were able to resolve the problems in a straightforward manner using the DATEC system alarm and parameter information. Furthermore, the technical controllers stated near the end of the test program that they could think of no other alarms or monitor points which should be added to DATEC to improve the system adequacy in monitoring for PA/FI/TA.

6.1.8.2 DATEC Adequacy in Testing

The DATEC system adequacy in testing addresses the DATEC capability to accomplish communications system and equipment testing in both a sufficient and accurate manner as to provide the

PROCEDURE	DATE	TIME

R1. At the HUA in-service receiver waveguide, using the HP 570-30 Directional Coupler and HP 620B SHF Signal Generator, apply the following frequencies (deviation from center received frequency) at the levels and for the period of time indicated:

Frequency (Rec'd Freq.)	Level	Time
	-60, -50, -40, -30 dBm0	5 MIN
+ 3.15 MHz	~~-20~~, -30 & -40dBm0	~~TBD~~
- 3.15 MHz	-20, ~~-30~~ & -40dBm0	"
+ 6.3 MHz	-20, -30 & -40dBm0	"
- 6.3 MHz	-20, -30 & -40dBm0	"

R2. At the completion of step R1, restore equipment to baseline configuration.

R3. At HUA, using an HP 606B (or equivalent) test oscillator and the summing amp (a special piece of test equipment) configured as shown in Figure R-1, apply the following frequencies at the levels and for the period of time indicated: 6-21-77

1240 -40

Frequency	Level	Time	DATE	TIME	
3.1-64	-40, 30, 20 [illegible]	-10 [illegible]	6-21-77	[illegible]	-30
~~1.544~~MHz	~~-20~~ and -30dBm0	~~TBD~~		1255	-30
3.088MHz	-20 and -30dBm0	"		1305	-25
6.176MHz	-20 and -30dBm0	"		1312	-20
12.352MHz	-20 and -30dBm0	"			

R4. At the completion of step R3, restore equipment to baseline configuration. 1328

CONDUCTED BY C. L. Christney 6-21-77

OBSERVED BY ______________________

DATEC SYSTEM EVALUATION WORKSHEET

21 June 1977/pg #3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
systems green...///RR		6/21	1300
System overview show amber on the REC "A" mux and T1WB1..../ph	#5/21 June 1977		1310
Request maint switch from "A" to "B" rec mux at HUA....and check out the "A" mux for framing error tbls..../ph			1312
Maint a dvise that "A" mux is good, when we shifted to the "B" mux all amber conditions cleared...advised maint to switch to "A" mux. maint advise possible cause of framing errors was a clean-up team working in and around the mux may have jarred something..../ph			1315
SBL "B" radio in amber on system overview, reason unknown..asked SBL to check his radio,../ph	6/7/21 June 1977		1316
Link performance indicates both eye margins are low on SBL rec..../ph			1320
Requested that SBL check out for any interference on his rec.../ph			1325
Maintenance advises that he is send the interference on his transmitter, he switched to the "B" transmitte r while he is working on the "A"...../ph			1328
Dis lays used: System overview Link Status Link performance (Most Help)			
TECH CONTROLLER ______ OBSERVED BY ______			

#5 21 June 77

```
IQ-ØØ8                               SYSTEM OVERVIEW                TIME  172/13Ø9:Ø4
              HUA         SBL
RADIO A        .           .
      B        .           .
MUX SW         .           .
     A         .           .
     B         .           .
CY1Ø4          .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
T1WB1          .AØ1<       .
               .           .
               .           .
           .........................
TELEMETRY.          .           .
         .          .           .
SITE     .          .           .
```

```
AS-2                                 SYSTEM OVERVIEW                TIME  172/131Ø:32
              HUA         SBL
RADIO A        .           .
      B        .           .
MUX SW         .           .
     A         .A1<        .
     B         .           .
CY1Ø4          .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
               .           .
T1WB1          .AØ1<       .
               .           .
               .           .
           .........................
TELEMETRY.          .           .
         .          .           .
SITE     .          .           .
```

#6 21 June 77

```
MAC-1-16-17                         LINK STATUS                          TIME  172/1314:27
                               ......T1-4000......                       ......RADIO......
                                  HUA        SBL                            HUA        SBL
     ARM        SW MAJOR                  .                  TX PROB                .
                SW MINOR           *      .                  RX PROB                .
                MAJOR                     .                                         .
   STATUS       TX IN SVC          A      .     A            TX IN SVC     A        .     A
                RX IN SVC          B      .     A            RX IN SVC     A        .     A
                MAINT                     .                  MAINT                  .
   PARAMETER    FER             <1.0E-7   .<1.0E-7           RX SQUELCH             .
                CRFRM                     .                  RSL MARGIN   39.667    . 38.693
                                                             EYE MARGIN   12.346    . 8.2548
                BER COR         NO DATA   .NO DATA           EYE AMPL    -3.9677    .-9.1741
                                                            EYE HITS       0.0   .     0.0
                                                             DER BER     6.2E-13    . 7.[illegible]E-11
                                                                                    PAGE 1
```

```
MAS                                         SYSTEM OVERVIEW                 TIME  172/1316:02
               HUA           SBL
RADIO A         .              .
      B         .          >SA.
MUX SW          .R<>           .
     A          .              .
     B          .              .
CY104           .              .
                .              .
                .              .
                .              .
                .              .
                .              .
                .              .
                .              .
TIMB1           .              .
                .              .
                .              .
           ........................
TELEMETRY.           .           .
         .           .           .
SITE     .           .           .
```

#7 21 June 77

```
MAC-3-J1-06             LINK PERFORMANCE ASSESSMENT - RADIOS          TIME  172/1320:07
                 LAST    LAST HR    LAST 24 HR          LAST 30 DAYS        LAST 30 MINS
                 SCAN     MEAN     MEAN      DEV       MEAN      DEV       MEAN    DEV
 HUA RSLMAR 32.140    31.243   28.952   5.5265    27.369   10.649  ----------------- DB
     EYEMAR 12.119    12.119   14.967   2.8853    14.962   2.2468  ----------------- DB
     RSLAVL 1.0000    1.0000   .95699   --------  .95222   ------------------------- RATE
     EYEAVL 1.0000    1.0000   .95745   --------  .94612   ------------------------- RATE
     EYEHIT    0.0       0.0   7.3672   19.939    12.749   37.582  ----------------- /SC
 HUA RSLMAR 32.719    32.434   31.475   1.4795    27.611   9.1418  ----------------- DB
  B  EYEMAR 5.7603    5.7603   5.5211   1.8156    7.7197   2.5145  ----------------- DB
     RSLAVL 1.0000    1.0000   1.0000   --------  .99167   ------------------------- RATE
     EYEAVL 1.0000    1.0000   1.0000   --------  0.9947   ------------------------- RATE
     EYEHIT    0.0       0.0   .05794   .37409    3.4285   5.2851  ----------------- /SC
 SBL RSLMAR 39.375    38.987   39.636   .59969    37.956   2.3217  ----------------- DB
  A  EYEMAR 8.2543    8.2548   12.645   .66484    12.688   2.1798  ----------------- DB
     RSLAVL 1.0000    1.0000   1.0000   --------  .93436   ------------------------- RATE
     EYEAVL 1.0000    1.0000   1.0000   --------  0.9978   ------------------------- RATE
     EYEHIT    0.0       0.0      0.0      0.0    1.3953   3.3537  ----------------- /SC
 SBL RSLMAR 38.100    38.150   37.114   1.5150    33.937   2.6584  ----------------- DB
  B  EYEMAR 3.3073    3.3073   12.754   .51993    13.274   1.1154  ----------------- DB
     RSLAVL 1.0000    1.0000   1.0000   --------  .93436   ------------------------- RATE
     EYEAVL 1.0000    1.0000   1.0000   --------  0.9987   ------------------------- RATE
     EYEHIT    0.0 .     0.0   .09126   .30356    .47788   1.0274  ----------------- /SC
```

```
AS-2          AS-2                              SYSTEM OVERVIEW                TI
              HUA          SBL
RADIO A        .           >IA.
      B        .           >SA.
TRK ST         .            .
     A         .            .
     B         .            .
CYTUM          .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
               .            .
TIYUM          .            .
               .            .
               .            .
          ..........................
TELEMETRY.          .           .
                    :           :
HI        .         .           .
```

PROCEDURE	DATE	TIME
Reciprocal Path Problem		
N1. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at both HUA and SBL.		
Transmit Antenna Only at Sibyl		
N2. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at HUA and the B receiver only at SBL. (Accomplished by inserting 10dB of attenuation in transmit waveguide @ SBL)	6-21-77	~~[illegible]~~ 1100
N3. Restore equipment to baseline configuration		1109

CONDUCTED BY C. L. Christner 6-21-77

OBSERVED BY ____________________

DATEC SYSTEM EVALUATION WORKSHEET 21 June 77, Pg # 2

OBSERVANCE (key points only)	PRINTOUT (ATTACH)	DATE	TIME
Systems again Green...////RR		6/21	0930
[illegible] Maint advised they are taking control of the system cause something wrong....			1034
System returned to Control...all green....			1055
System overview shows Amber Inservice on the "A" rcvr at HUA and Amber Standby on the "B" radio rcvr at HUA..../pjh	3/21 June 1977		1100
Link performance displays show low rec rsl on both ra dios at HUA..../ph	4/21 June 1977		1102
Requested SBL switch to the "B" transmitter to HUA..../pjh			1103
RSL continues to drop...SBL switched back to "A" xmtr..../pjh			1106
REquested maint have SBL check out their transmit antenna to HUA.../pjh			1108
Maint advised SBL transmit antenna off alignment, antennna team corrected to restore service...			1110
All systems good att..../pjh			1111

Displays Used....

1. System overview
2. Lisk Status
3. Link performance (Best for this problem)

TECH CONTROLLER ____________________

OBSERVED BY ____________________

#3 /21 June 77

```
IQ-ØØ8                                    SYSTEM OVERVIEW                  TIME  172/11?Ø:45
                 HUA          SBL
RAF   A          .AI<          .
      B          .AS<          .
MUX SW            .            .
      A           .            .
      B           .            .
CY1Ø4             .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
T1WB1             .            .
                  .            .
                  .            .
                  .            .
          ......................
TELEMETRY.        .            .
         .        .            .
SITE     .        .            .
```

```
MAS                                    LINK STATUS                         TIME  172/11?1:48
                                  ......T1-4ØØ?......                      .......RADIO......
                                   HUA          SBL                        HUA        SBL
   ALARM          SW MAJOR                .                TX PROB               .
                  SW MINOR                .                RX PROB               .
                  MAJOR                   .                                      .
   STATUS         TX IN SVC        A      .      A         TX IN SVC       A     .     A
                  RX IN SVC        A      .      A         RX IN SVC       A     .     A
                  MAINT                   .                MAINT                 .
   PARAMETER      FER           <1.ØE-7   .<1.?E-7         RX SQUELCH            .
                  CRFRM                   .                RSL MARGIN   24.472 A. 38.2??
                                                           EYE MARGIN   12.346  . 12.??5
                  BER COR       NO DATA   .NO DATA         EYE AMPL    -8.9677  .-9.??41
                                                           EYE HITS        ?.?  .     ?.?
                                                           DER BER      6.2E-13 . 9.6E-13
                                                                               PAGE 1
```

#1/21 June 77

IQ-ØØ5 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 172/11Ø2:53

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HW	RSLMAR	2Ø.473	29.176	29.08Ø	5.611Ø	27.369	1Ø.649	--------	--------	DB
A	EYEMAR	12.346	12.233	1Ø.499	2.7539	1Ø.969	2.9468	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.95876	--------	.95222	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	.96Ø78	--------	.94612	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	7.4687	19.879	12.749	37.582	--------	--------	/SC
HUA	RSLMAR	22.648	30.455	31.586	1.41Ø4	27.611	9.1418	--------	--------	DB
B	EYEMAR	5.6637	5.7023	5.6673	1.8493	7.7197	2.5145	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.99167	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9947	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø681Ø	.Ø7394	3.4285	5.2851	--------	--------	/SC
SBL	RSLMAR	38.2ØØ	38.543	39.315	.42963	37.956	2.3217	--------	--------	DB
A	EYEMAR	12.ØØ5	11.963	12.948	.31634	12.688	2.1798	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.997Ø	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	1.895Ø	3.3837	--------	--------	/SC
SBL	RSLMAR	35.833	35.734	37.5Ø2	1.3Ø26	33.937	2.6584	--------	--------	DB
B	EYEMAR	12.ØØ5	12.ØØ5	13.1Ø5	.166Ø1	13.274	1.1154	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9987	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.ØØ126	.ØØ356	.47788	1.9274	--------	--------	/SC

IQ-ØØ6 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 172/11Ø7:17

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	18.896	18.896	28.742	5.5Ø29	27.369	1Ø.649	--------	--------	DB
A	EYEMAR	12.346	12.233	1Ø.499	2.7539	1Ø.969	2.9468	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.95652	--------	.95222	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	.96Ø78	--------	.94612	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	7.4637	19.879	12.749	37.582	--------	--------	/SC
HUA	RSLMAR	21.Ø44	21.Ø44	31.372	1.4196	27.611	9.1418	--------	--------	DB
B	EYEMAR	5.6637	5.7023	5.6673	1.8493	7.7197	2.5145	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.99167	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9947	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø681Ø	.Ø7394	3.4285	5.2851	--------	--------	/SC
SBL	RSLMAR	38.7ØØ	38.562	39.815	.42963	37.956	2.3217	--------	--------	DB
A	EYEMAR	12.ØØ5	11.963	12.948	.31634	12.688	2.1798	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.997Ø	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	Ø.Ø	Ø.Ø	1.895Ø	3.3837	--------	--------	/SC
SBL	RSLMAR	27.182	34.665	37.5Ø2	1.3Ø26	33.937	2.6584	--------	--------	DB
B	EYEMAR	11.562	11.734	13.1Ø5	.166Ø1	13.274	1.1154	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98436	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9987	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.ØØ126	.ØØ356	.47788	1.9274	--------	--------	/SC

technical controller the information he needs to maintain the digital transmission system performance requirements. The field testing addressed testing adequacy in two ways. First, the DATEC validation testing confirmed the basic measurement accuracy. Second, the DATEC scenario testing addressed the sufficiency of the measurements performed to enable the technical controller to maintain the communications system. Test results support the adequacy of DATEC in both the measurement accuracy and sufficiency areas.

Specific reference is made to Paragraph 6.1.3, wherein additional testing was performed to further evaluate the accuracy of the baseband eye monitor derived bit error rate and the event per unit time monitor measured multiplexer frame error rate when compared to the actual T1 bit error rate measured using a standard laboratory type bit error rate measuring set. The test results confirmed the accuracy and sufficiency in testing the communications system for BER.

6.1.8.3 Adequacy in Analyzing

The DATEC adequacy in analyzing the monitored data addresses two areas of the system performance. First, the adequacy in analyzing the data as it relates to the accuracy of the data analysis. Second, the adequacy in analyzing the data as it relates to the sufficiency of the data analysis. The validation test results in Appendices A through J of the Field Test and Evaluation Report address, in detail, the accuracy of the data analysis.

Particular attention was paid to the data processing and accuracy required in the data conversion and trending algorithms. The validation test data supports the adequacy of the monitor data analysis. The adequacy in data analysis, as it relates to sufficiency, is illustrated by the system scenario evaluation test results in Appendices K through FF, the excerpts of which are included throughout this section.

6.1.8.4 DATEC Adequacy in Presenting/Reporting

The DATEC system adequacy as it relates to the presenting and reporting of data addresses the CRT displays and formats. The technical controllers made repeated reference throughout the system scenario testing to the usefulness of the system overview display and the link status displays. See the scenario worksheets in Appendix DD for examples of such comments. The technical controllers recommended a different format for the system overview display when the system is used to monitor more than six sites. The proposed display content would remain essentially unchanged except for the addition of digroup and link identification numbers.

HIGHER MUX FAILURE, T1WB1 CHANNEL CARD

PROCEDURE		
DD1. At HVA, disable the NORMAL T1-4000 Channel 7 RCV. card by breaking the card edge connections to the card nest.	6-16-77	1107
DD2. At the completion of the test, reinsert the Channel 7 card into the card nest.		1124
Requested T1 WB1 loopback @ HVA & SBL @ 1113. Normalled everything @ 1124		

CONDUCTED BY C. L. Christner 6-16-77

OBSERVED BY

DATEC SYSTEM EVALUATION WORKSHEET 16 June 77, Pg # 2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems again Green...../////RR		6/16	1100
CRT (overview) display indicates the T1WB1 is RED Flagged, both at HUA and SBL...///RR	6/16 June 77		1107
Requested HUA maint pull in-house loop on the T1WB1...A lso requested they have SBL do same..///RR Maint voltages at HUA checked good..///RR			1112
Maint voltages at SBL check good also...In-house loop on the T1WB1 at HUA is good...///RR			1114
Maint advsd that the in-house loop at SBL is good also...Requested SBL maint loop the T1-4000 chnl back to us..///RR			1120
Chnl loop frm SBM bad..Requested maint check chnl cards both here and at SBL...///RR			1123
Maint advsd that there was a bad recv chnl card on T1-4000 at HUA.. Maint replaced same..///RR			1125
Problem isolated to bad recv chnl card in T1-4000 at HUA..///RR			
Displayse deemed useful.....			
1. Systems overview			
2. Link Status Pg # 2			

TECH CONTROLLER

OBSERVED BY

#6 16 June 77

```
MA-2                           SYSTEM OVERVIEW              TIME  167/1138:17
              HUA       SBL                           MAJOR ALARM
RADIO A        .         .
      B        .         .
MU. SW         .         .
     A         .         .
     B         .         .
CY104          .         .
               .         .
               .         .
               .         .
               .         .
               .         .
               .         .
               .         .
T1   1         .RJ1<><>01R.
               .         .
               .         .
          .........................
TELEMETRY.          .         .
          .         .         .
SITE      .         .         .
```

```
AS                       LINK STATUS                            TIME  167/1139:05
                   .......CY-104.......                   .......TIN31......
                         HUA        SBL                         HUA     SBL
  ALARM      SERVICE         .                  OFFICE           *   .   *
                             .                                       .
                             .                                       .
             REMOTE          .                                       .
                             .                                       .
                             .                                       .
  STATUS     MAINT           .                  MAINT                .
                             .                                       .
                             .                                       .
  PARAMETER  CHANNEL         .                  BER     <1.0E-6  .<1.4E-6
                             .                  REFRAME              .
                             .
  SITE       ENTRY           .
  ALARMS     FIRE            .
             AC PWR          .
             BATTERY         .
             H.A. PR         .
             T.G. HV         .
             FLOOD           .
                                                                       PAGE 2
```

6.1.8.5 DATEC Effectiveness in Monitoring

Monitoring is defined to be the continual scanning, analysis, and reporting of system alarm and monitor points. This was the underlying design objective of the DATEC system. The successful demonstration of this capability was threaded throughout the field test results. In fact, the starting point for each of the scenarios was to place the DATEC system in the normal scan mode and wait until the system overview display alerted the technical controller to a system problem. There can be no doubt in the effectiveness of the DATEC monitoring function.

6.1.8.6 DATEC Effectiveness in Testing

The DATEC system effectiveness in testing addresses the usefulness of the measured data in allowing the technical controller to satisfy the performance requirements of the digital transmission system. The scenario test results in Appendices K through FF referred to in this section, demonstrate the usefulness of the measured parameters.

6.1.8.7 DATEC Effectiveness in Analysis

The DATEC system validation test results in Appendices A, B and E illustrate the system effectiveness in monitored data analysis and the resultant trend analysis of the monitored parameters. In each case the computer clock was moved ahead in order to move the data through the trend analysis tables. Using the acquired data, the effectiveness of the computer program in accomplishing the data reduction and trend analysis was confirmed.

6.1.8.8 DATEC Effectiveness in Presenting/Reporting

The DATEC effectiveness in the presenting and reporting of data was demonstrated by the system scenario evaluation testing and the technical controller comments as to the usefulness of the system overview and link status displays referenced on the technical controller worksheets (see pages 347 through 352).

6.1.8.9 DATEC Feasibility in Monitoring

The DATEC feasibility in monitoring CPMAS requirements was confirmed throughout the system scenario tests. The DATEC monitoring function is the foundation upon which the alarms and parameter data information collection process is built for it is the scanning, data analysis, and reporting of the measured information to the technical controller that enables him to maintain the required system performance. The feasibility of DATEC to perform monitoring was successfully accomplished for all alarms and parameters.

6.1.8.10 DATEC Feasibility in Testing

The DATEC feasibility in testing CPMAS requirements was confirmed by the validation test results in Appendices A through J of the Field Test and Evaluation Report. The validation tests addressed all the alarm and monitor point measurements required to monitor the digital transmission system. The successful execution of the validation testing demonstrated DATEC's feasibility in testing for CPMAS information.

6.1.8.11 DATEC Feasibility in Analyzing

The DATEC feasibility in analyzing data for CPMAS information was demonstrated throughout the field testing by the continual updating of monitored parameters. Test data illustrating the feasibility of DATEC data analysis is contained in the validation Appendices A through J in the Field Test and Evaluation Report.

6.1.8.12 DATEC Feasibility in Presenting/Reporting

The DATEC system feasibility in presenting and reporting CPMAS information is demonstrated by the usefulness of the CRT displays during the system scenario evaluation testing. Reference to the CRT display usefulness is addressed on the technical controller scenario worksheets wherein, taken collectively, it was stated that the system overview and link status displays were judged most useful followed by the link performance displays for certain classes of system degradation. Therefore, the feasibility of the CRT displays was successfully demonstrated, not only in their generation, but also in their application or usefulness in helping the technical controller accomplish the system goals of PA/FI/TA.

6.1.9 The Accuracy, Reliability, Utility, and Completeness of the Data Queries, Analyses, Summaries, and Output Displays

The accuracy, reliability, utility and completeness of the data queries, analyses, summaries, and output displays are addressed in the following paragraphs.

6.1.9.1 Accuracy Versus Data Queries and Analysis

The DATEC accuracy of data queries and analysis are documented in the validation test results in Appendices A through J. The test results document DATEC accuracy capabilities in the areas of monitor point data acquisition and its subsequent analysis. The demonstrated tolerances on voltage measurements were within the requirement of ±1 percent. The demonstrated tolerances on derived parameters like BER and FER were within the requirement of ±1 order of magnitude.

6.1.9.2 Accuracy of Summaries and Output Displays

The DATEC accuracy of summaries and output displays addresses the capability of DATEC to process the monitored data in such a manner as to enable the parameter value and trend analysis information to be a faithful reproduction of the actual data as it was collected by the monitor system. This faithful reproduction capability was confirmed as a part of the validation testing wherein the testing centered upon a cause and effect relationship for fault occurrence and measured value. The accuracy was confirmed by comparing DATEC measured values against those obtained using laboratory equipment (i.e., voltmeters) and then performing the computer analysis function by hand in order to make a direct comparison of the measured value accuracy to that presented on the CRT display. The DATEC system satisfactorily satisfied all accuracy and reporting tests performed during the field test.

6.1.9.3 Reliability of Data Queries, Analyses, Summaries, and Output Displays

The DATEC reliability as it applies to data queries, analyses, summaries and output displays addresses the usefulness and effectiveness of the DATEC monitored data in allowing the technical controller to accomplish PA/FI/TA on the digital transmission system. The system scenario test results in Appendices K through FF which appear throughout this section illustrate in the majority of cases that the technical controller was able to successfully execute the system scenario given the DATEC performance data. Examples exist, however, where the particular system degradation remained unconfirmed as to cause and effect in some instances. For example, Appendix K, the RF fade scenario, presented problems for the technical controllers when it addressed a single receiver RF fade.

This problem was particularly troublesome because the radio would switch to the standby unit upon the first occurrence of a single receiver fade thereby causing future fades to go unnoticed unless the technical controller happened to refer to the link performance assessment display for radio performance. Using this example, the reliability of the data queries and analysis was unaffected, however, the summaries and output displays failed in a few instances to adequately display to the technical controller the system problem. This apparent deficiency is easily resolved, however, by adding either more information to the system overview display or by placing alarm thresholds on the trend analysis information.

6.1.9.4 Utility of the Data Queries, Analyses, Summaries and Output Displays

The DATEC utility of the data queries, analyses, summaries, and output displays was one of the major items considered and evaluated during the field test. It was for this very purpose that the system evaluation scenarios were structured to include experienced technical controllers as part of the test team. In determining the utility of the DATEC system the technical controllers were given simulated link and equipment problems and then using the DATEC system they proceeded to identify and resolve the communications system fault or degradation. The test results in Appendices K through FF illustrate the utility of the data queries, analyses, summaries and output displays in the execution by the technical controllers of the system evaluation scenarios.

Specific reference is made to Appendix DD test scenario executed on 16 June wherein the system overview display alerted the technical controller to a problem in the T1WB1 multiplexer. Through the use of the DATEC system, augmented by the results of equipment switchovers by maintenance, the technical controller was successful in identifying the problem as a failure in the Channel 1 receive card in the T1-4000 multiplexer thereby demonstrating the utility of the data queries, analyses, summaries and output displays. (Refer to pages 379 through 381.)

6.1.9.5 Completeness of Data Queries and Analyses

The DATEC completeness of data queries and analyses is demonstrated by the validation test results in Appendices A through J, and the comments from the technical controllers at the conclusion of the test program when they said that they felt the DATEC monitor point selection (data queries) and subsequent data processing was adequate to enable the technical controller to accomplish PA/FI/TA of the digital transmission system.

6.1.9.6 Completeness of Summaries and Output Displays

The DATEC completeness of summaries and output displays is illustrated by the successful execution of the system scenario evaluations in Appendices K through FF. The technical controllers were critical, however, of the format chosen for the system overview and link status displays. They made specific reference to the need for a different system overview format when monitoring more than six sites. It was also suggested that the link status display be reformatted. The recommended format changes are discussed in Paragraph 6.3.2.2.

6.1.10 The Accuracy, Reliability, and Utility of the DATEC Measurements Relative to Circuits of Different Qualities, (i.e., Determine the Operational Scope of the DATEC Measurements)

Throughout the rest of this report, the discussions regarding PA/FI/TA pertain mainly to digital circuit qualities, and there are numerous examples to illustrate DATEC's utility and effectiveness in this area. One capability of DATEC which has not been discussed in much detail is the IQCS measurement made on the VF channels of the CY-104.

The DATEC system uses the PATE configured as an ISVF (in-service voice frequency) monitor for making in-service channel measurements. The DATEC selected VF channel measurements are those of average power level and 2600 Hz signal to noise. These measurements are made on those channels which are selected for scanning by DATEC. The complete ISVF in-service measurement capability, including a channel spectrum plot, is available using operator interaction (Monitor Immediate) on those channels connected to DATEC or on any other VF channel by connecting it to DATEC through the patch panel on the PATE equipment rack.

The validation test in Appendix H addressed the DATEC VF measurement capability by performing measurements on both 1000 Hz and 2600 Hz tones. The system was demonstrated as being able to accurately measure both average levels and 2600 Hz signal to noise ratios.

The system scenario evaluation testing which addressed VF channel measurements is in Appendix W. The scenario execution as accomplished by the tech controllers on 9 June 1977, demonstrated the reliability and utility of the measurement data in identifying and correcting VF channel problems. The scenario execution made use of the DATEC monitor immediate capability to identify the channel problems using the measured data and VF spectrum plot. Having access to the complete ISVF measurement and analysis capability provided a valuable tool in further analyzing the channel level problems.

In order to further evaluate the DATEC capability relative to circuits of different qualities, additional VF channel testing was performed using a VF channel simulator on loan from RADC.

The channel simulator was connected to Channel 1 of the CY-104. The purpose of the test was to see if the ISVF, which is designed for in-service measurements only, could be useful in identifying VF channel problems other than those affecting average level or 2600 Hz signal to noise ratio. The channel simulator provided the capability of injecting broadband noise, impulse noise, phase hits, and phase jitter onto a VF channel.

PROCEDURE	DATE	TIME
W1. Connect the Hp 654 test oscillator to the HBA CY-104, channel number 1.	6/9/77	1455
W2. Set the level at the channel input to -20dBm0 at 2600 Hz ± 10 Hz.		1455
W3. After 10 minutes reduce the level of the 2600 Hz tone by 10dB and continue to reduce the signal level at a rate of 5dB per 5 minutes until a total of 40dB attenuation is introduced. This corresponds to a signal level of -60dBm0. Record the time each increment of attenuation is introduced.		1505
10dB		1505
15dB — PROB. IDENTIFIED AFTER 10 dB DROP IN 2600 Hz SIG. LEVEL		
20dB		
25dB		
30dB		
35dB		
40dB		
45dB		
50dB		
55dB		
60dB		
W4. Set the test oscillator signal level to -13dBm at the channel input at 1000 Hz ± 10 Hz.	6/9/77	1535
W5. After 10 minutes increase the signal level by 3dB and continue to increase the signal level by 1dB every 5 minutes until the signal level is +12dBm0. Record the time the signal level is increased.		
3dB — PROB IDENTIFIED AFTER 3 dB INCREASE IN 1000 Hz SIG. LEVEL.		1545
4dB		
5dB		
6dB		
7dB		
8dB		
9dB		
10dB — COMPLETED		1600
11dB		
12dB		

CONDUCTED BY T. Cam[illegible] 6/9/77

OBSERVED BY ✓

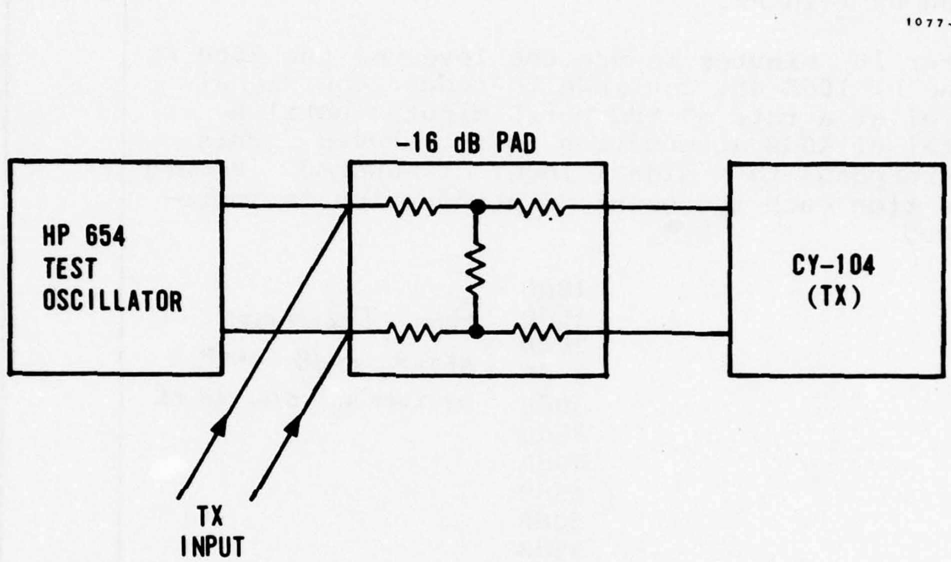


Figure W-1. Test Configuration,
User VF Channel Degradation

DATEC SYSTEM EVALUATION WORKSHEET

9 June 1977 Page #4

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
All stat & sys clear		6/9	1500
System overview shows problem on the CY104 (Amber) .../ph	19/9	6/9	1503
Link status shows amber channel on the CY104 at HUA...Trying to isolate problem.../ph	19/9	6/9	1505
After using "G1" and getting channel stats, found that the rec channel one at HUA, S/N was in amber, advised maint to check out channel.../ph	20/9	6/9	1506
66			
The GI dump proves to be a fast and efficient way of locating particular problems within the channel [illegible] on the CY104 (SO FAR ???)			
Maintenance advises that there was a bad rec channel on the CY104 at HUA/Replaced...ph			1510
END PART I			
All systems Clear		6/9	1546
Link Sta tus and System Overview indicate CY 104 s in amber...//cs	21/ 9June 77		1548
G1 Channel Scan indicated HUA had a hot transmit, on channel 1. from user, req uested user check his level , he adjusted his levels and problem cleared at 1558..//cs	22/ 9June 77		1550
problem was hot customer level.			
System Overview inconjunction with the G1 Channel Sca n program were highly effective in problem isolation./cs			

TECH CONTROLLER ____________

OBSERVED BY ____________

19/7 June 77

"AC-3-01-06 SYSTEM OVERVIEW TIME 160/1503:

	HUA	SBL
RADIO A	.	.
B	.	.
MUX SW	.	.
A	.	.
B	.	.
CY104	.AØ1>	.
T1WB1	.	.
TELEMETRY	.	.
SITE	.	.

IQ-ØØ7 LINK STATUS TIME 16Ø/1505:17

		CY-104 HUA	CY-104 SBL		T1WB1 HUA	T1WB1 SBL
ALARM	SERVICE	.		OFFICE		.
	REMOTE	.				.
STATUS	MAINT	.		MAINT		.
PARAMETER	CHANNEL Ø1A	.		FER	<1.ØE-6	.<1.ØE-6
				REFRAME		.
SITE ALARMS	ENTRY	.				
	FIRE	.				
	AC PWR	.				
	BATTERY	.				
	W.A. PR	.				
	W.G. HV	.				
	FLOOD	.				

PAGE 2

20/9 June 77

```
AL   SN+31.1 S  160/1506 0006
AV   3.9      FR+2604     CN-45.0     SN+31.1AL  WF-44.6     NC+15.8
VU-13.8       PA+00.6     M1+00.1     M5+00.1    FR+2604     SW+0072

SPECTRUM 6----5----4----3----2----1----0----1
 01 -64.7
 02 -63.9
 03 -64.0
 04 -63.1
 05 -63.0
 06 -62.5
 07 -62.5
 08 -63.6
 09 -51.4*****
 10 -45.9********
 11 -51.9*****
 12 -62.6
 13 -59.6*
 14 -60.8
 15 -64.7
 16 -63.2
 17 -62.8
 18 -63.3
 19 -64.0
 20 -63.4
 21 -62.1
 22 -62.3
 23 -62.8
 24 -56.9**
 25 -20.5********************
 26 -13.9************************
 27 -19.4*********************
 28 -54.4***
 29 -61.8
 30 -63.3
 31 -64.3
 32 -64.0
 33 -64.0
 34 -65.3
 35 -66.1
 36 -65.6
 37 -68.5
 38 -70.7
 39 -71.3
 40 -74.9
```

#21 9 June 77

```
MAS                                   LINK STATUS                    TIME 160/154
                          ......CY-104......                  ......TIWB1......
                            HUA          SBL                     HUA      SBL
ALARM       SERVICE                .                OFFICE        .
                                   .                              .
            REMOTE                 .                              .
                                   .                              .
STATUS      MAINT                  .                MAINT         .
                                   .                              .
PARAMETER   CHANNEL Ø1A            .                FER   <1.ØE-6 .<1.ØE-6
                                   .                REFRAME       .
SITE        ENTRY                  .
ALARMS      FIRE                   .
            AC PWR                 .
            BATTERY                .
            W.A. PR                .
            W.G. HV                .
            FLOOD                  .
                                                                 PAGE 2
```

```
IQ-ØØ6                     SYSTEM OVERVIEW                 TIME 16Ø/1548:51
            HUA         SBL
RADIO A      .           .
      B      .           .
MUX SW       .           .
      A      .           .
      B      .           .
CY1Ø4       .AØ1>        .
             .           .
             .           .
             .           .
             .           .
TIWB1        .           .
             .           .
             .           .
        .......................
TELEMETRY.          .         .
        :          :         :
SITE     .          .         .
```

#22 9 June 77

```
G1

160/1550

1c  1550  MT.NO=00  MODE= 02

CY-104...HUA...CH'S..1&13

AH   AV-10.6 TT 160/1550 0005
AV-10.6AH   FR+1004      CN-84.5      SN+73.8      WF-74.6      HD+69.3
VU-10.6     PA+00.0      M1+00.3      M5+00.0      FR+1004      SW+0072

SPECTRUM 6----5----4----3----2----1----0----1
 01 -73.2
 02 -93.1
 03 -93.1
 04 -93.1
 05 -93.1
 06 -76.7
 07 -67.1
 08 -54.9***
 09 -17.2***********************
 10 -10.7**************************
 11 -16.2***********************
 12 -53.7****
 13 -66.8
 14 -75.7
 15 -93.1
 16 -93.1
 [illegible] -93.1
 [illegible] -93.1
 19 -93.1
 20 -93.1
 21 -93.1
 22 -93.1
 23 -93.1
 24 -93.1
 25 -93.1
 26 -93.1
 27 -93.1
 28 -93.1
 29 -93.1
 30 -79.9
 31 -93.1
 32 -93.1
 33 -93.1
 34 -93.1
 35 -93.1
 36 -93.1
 37 -93.1
 38 -93.1
 39 -93.1
 40 -93.1
```

The test results showed that the ISVF was very effective in measuring stationary perturbations (except phase jitter) but that its usefulness in catching transient events, like impulse noise, is dependent upon the ISVF taking a channel signal sample coincident with the transient event occurrence in order for the ISVF to be effective in detecting the perturbation.

The test results are included as a part of this write-up for reference. The testing addressed the DATEC measured VF channel performance during induced perturbations of broadband noise, impulse noise, phase hits, and phase jitter. A summary of the test results is presented in Table 6-7.

The test results demonstrate the need to be able to make a comprehensive set of VF measurements on selected channels. This can be easily accomplished by using the PATE configured as an I/OSVF instead of its current ISVF configuration. The test results also illustrate the usefulness of the spectrum plot in analyzing VF channel problems like increasing PCM quantizing noise, which would be readily apparent as a reduction in the signal to noise ratio.

6.1.11 The Accuracy, Reliability, and Utility of the Performance Assessment/Trend Analysis Capabilities to Resolve Degradations

Relative to the accuracy and reliability of DATEC's performance assessment and trend analysis (PA/TA) capabilities, this was verified during the validation phase of field tests. The key performance indicators such as RSL Margin, the Eye parameters-- Eye Margin and Derived Bit Error Rate-- and the T1-4000 and T1WB1 Frame Error Rate parameters were thoroughly checked with regard to alarming and trending. The parameter trending software algorithm was verified for the three basic types of parameters: value, ratio, and count, through the "last 30 mths" columns of the Link Performance Assessment display (see in particular the field test data for Appendices B and D in Section II of the Field Test and Evaluation Report).

Except for the scenario of Appendix S, Special RSL Long Term Test, there were no tests conducted wherein degradation to the communication system was monitored over a relatively long period of time (that is, hours or days). There were, however, several scenarios which provide good examples of how-- even on a short term basis-- the tech controllers were able to utilize DATEC's PA/TA capabilities to resolve degradations. These examples address primarily the utility aspect of this topic; however, reliability is also demonstrated if it is considered that almost 60 scenarios were conducted over a 2-1/2 month period of time, wherein the PA/TA capabilities of DATEC were relied upon by the tech controllers to resolve degradations. The consistency which was displayed throughout this phase of field tests with regard to problem detection and isolation underscores the dependability of these DATEC capabilities.

TABLE 6-7. DATEC MEASURED VF CHANNEL PERFORMANCE

Test Description	Case No.*	Test Results
1. Baseline Test. 1000 Hz Tone at -13 dBm	1	Established baseline for comparison.
2. Impulse noise added to baseline. Impulse rate is 10/sec.	2_1	VF channel analysis shows presence of noise in the channel. Signal type is identified as wideband noise.
	2_2	VF channel analysis shows no presence of noise. Signal type is identified as a test tone. This illustrates the problem of trying to catch a transient event using a one-time sampled measurement device. NOTE: This measurement is normally performed by counting amplitude hits over several minutes as in the I/OSVF.
3. Phase hits and phase jitter added to baseline. Phase hit control was set to maximum and phase jitter was set to 60 Hz at 30 degrees.	3	VF channel analysis shows no presence of either phase hits or phase jitter. It is not surprising that the ISVF does not detect phase hits and phase jitter, it does not contain the required processing circuitry. These measurements are performed by the I/OSVF.
4. Broadband noise added to baseline.	4	VF channel analysis clearly identifies broadband noise since this type of interference is stationary and easily detected.

* See following data display printouts.

CASE 1 VF CHANNEL TESTING

```
IQ,MI,6,Ø,3

G   AV-13.1 TT 131/134Ø ØØØ6
AV-13.1G   FR+Ø997    CN-48.7    SN+35.6    WF-38.9    HD+44.7
VU-13.1    PA+Ø1.Ø    M1+ØØ.2    M5+ØØ.Ø    FR+Ø997    SW+ØØ71
VU-13.1 PA+Ø1.Ø SW+ØØ71 FR+Ø997 M5+ØØ.Ø

SPECTRUM 6----5----4----3----2----1----Ø----1
 Ø1 -38.2***********
 Ø2 -49.9******
 Ø3 -55.4***
 Ø4 -56.7**
 Ø5 -59.9*
 Ø6 -6Ø.3
 Ø7 -6Ø.4
 Ø8 -57.2**
 Ø9 -18.8*********************
 1Ø -13.1**************************
 11 -19.6*********************
 12 -57.7**
 13 -57.4**
 14 -58.2*
 15 -61.9
 16 -62.6
 17 -61.9
 18 -62.3
 19 -61.5
 2Ø -57.8**
 21 -6Ø.7
 22 -62.9
 23 -63.1
 24 -63.8
 25 -63.7
 26 -58.5*
 27 -57.6**
 28 -62.Ø
 29 -62.7
 3Ø -63.9
 31 -62.8
 32 -61.5
 33 -6Ø.9
 34 -62.Ø
 35 -63.9
 36 -65.Ø
 37 -67.2
 38 -69.6
 39 -71.8
 4Ø -69.6

G   AV-13.1 TT 131/1341 ØØØ6
AV-13.1G   FR+Ø997    CN-49.3    SN+35.9    WF-39.4    HD+45.3
VU-13.1    PA+Ø1.Ø    M1+ØØ.3    M5+ØØ.     FR+Ø997    SW+ØØ71
VU-13.1 PA+Ø1.Ø SW+ØØ71 FR+Ø997 M5+ØØ.

SPECTRUM 6----5----4----3----2----1----Ø----1
 Ø1 -38.3***********
 Ø2 -49.9******
 Ø3 -55.3***
 Ø4 -57.Ø**
 Ø5 -59.6*
 Ø6 -59.7*
```

CASE 2.

```
IO,MI,6,Ø,3

    AV-13.1 N  181/1343 ØØØ6
AV-13.1      PA+Ø5.7    CN-13.2     FN-13.1     WF-13.1
VU-13.Ø      PA+Ø5.7    M1+ØØ.9     M5+ØØ.2     FR+Ø997     SW+ØØ76
VU-13.Ø PA+Ø5.7 SW+ØØ76 FR+Ø997 M5+ØØ.2

SPECTRUM 6----5----4----3----2----1----Ø----1
 Ø1 -37.8**************
 Ø2 -43.3**********
 Ø3 -43.Ø**********
 Ø4 -43.2**********
 Ø5 -43.3**********
 Ø6 -43.9**********
 Ø7 -44.8*********
 Ø8 -45.4*********
 Ø9 -18.7************************
 1Ø -13.1 **************************
 11 -19.5************************
 12 -53.Ø****
 13 -54.2 ***
 14 -56.3**
 15 -6Ø.9
 16 -59.4*
 17 -57.3**
 18 -56.6**
 19 -54.8***
 2Ø -53.7****
 21 -55.5***
 22 -56.1 **
 23 -55.7 ***
 24 -55.1 ***
 25 -57.4**
 26 -56.5**
 27 -57.5**
 28 -62.Ø
 29 -63.5
 3Ø -63.9
 31 -63.Ø
 32 -61.6
 33 -59.2*
 34 -6Ø.5
 35 -64.5
 36 -64.3
 37 -66.7
 38 -67.9
 39 -7Ø.3
 4Ø -7Ø.4

G   AV-13.1 TT 181/1343 ØØØ6
AV-13.1G     FR+Ø997    CN-49.3     SN+36.7     WF-38.2     HD+44.7
VU-13.Ø      PA+Ø5.3    M1+Ø1.2     M5+ØØ.3     FR+Ø997     SN+ØØ71
VU-13.Ø PA+Ø5.3 SN+ØØ71 FR+Ø997 M5+ØØ.3

SPECTRUM 6----5----4----3----2----1----Ø----1
 Ø1 -38.Ø**************
 Ø2 -49.2******
```

CASE 2.

```
03 -55.7***
04 -56.4**
05 -59.8*
06 -60.3
07 -59.6*
08 -56.7**
09 -18.7************************
10 -13.1***************************
11 -19.5************************
12 -57.2**
13 -57.7**
14 -59.1*
15 -62.1
16 -62.3
17 -63.4
18 -63.6
19 -64.4
20 -57.0**
21 -61.0
22 -62.0
23 -63.3
24 -63.3
25 -62.8
26 -53.6*
27 -57.3**
28 -61.4
29 -64.0
30 -63.5
31 -63.4
32 -62.7
33 -62.9
34 -63.4
35 -63.6
36 -65.3
37 -67.9
38 -63.1
39 -62.5
40 -70.0
```

CASE 3

```
IQ,MI,6,Ø,3

G   AV-13.1 TT 181/1345 ØØØ6
AV-13.1G   FR+ØØ97    CN-48.6    SN+35.5    MF-38.7    MD+44.9
VU-13.1    PA+Ø1.Ø    MI+ØØ.2    M5+ØØ.1    FR+ØØ97    SW+ØØ71
VU-13.1 PA+Ø1.Ø SW+ØØ71 FR+ØØ97 M5+ØØ.1


SPECTRUM 6----5----4----3----2----1----Ø----1
 Ø1 -38.Ø*************
 Ø2 -48.3******
 Ø3 -55.7***
 Ø4 -57.Ø**
 Ø5 -58.7*
 Ø6 -59.5*
 Ø7 -6Ø.8
 Ø8 -56.1**
 Ø9 -18.3************************
 1Ø -13.1****************************
 11 -19.6************************
 12 -57.5**
 13 -57.3**
 14 -58.4*
 15 -62.2
 16 -62.4
 17 -62.4
 18 -61.9
 19 -63.3
 2Ø -58.Ø*
 21 -63.4
 22 -61.2
 23 -61.3
 24 -63.Ø
 25 -62.4
 26 -58.9*
 27 -57.3**
 28 -62.6
 29 -64.7
 3Ø -63.1
 31 -62.7
 32 -62.6
 33 -61.5
 34 -61.7
 35 -62.6
 36 -63.7
 37 -67.1
 38 -69.7
 39 -71.9
 4Ø -73.5
```

BEST AVAILABLE COPY

CASE 4

```
IQ,MI,6,0,3
    AV-11.9 WH 181/1346 0006
AV-11.9     PA+06.6     PI-05.4     R1+01.8
VU-11.7     PA+06.6     M1+02.4     M5+00.8     FR+0996     SW+0774
VU-11.7 PA+06.6 SW+0774 FR+0996 M5+00.8

SPECTRUM 6----5----4----3----2----1----0----1
 01 -34.7*************
 02 -33.8***************
 03 -32.7***************
 04 -31.7****************
 05 -32.0****************
 06 -31.4****************
 07 -31.6****************
 08 -32.5***************
 09 -18.3***********************
 10 -13.1*************************
 11 -19.4**********************
 12 -33.1***************
 13 -32.2***************
 14 -30.9****************
 15 -30.6****************
 16 -31.7****************
 17 -31.2****************
 18 -31.0****************
 19 -31.3****************
 20 -31.9****************
 21 -32.1***************
 22 -31.4****************
 23 -30.6****************
 24 -32.2***************
 25 -32.3***************
 26 -31.4****************
 27 -30.9****************
 28 -30.9****************
 29 -31.4****************
 30 -31.4****************
 31 -31.7****************
 32 -32.3***************
 33 -33.1***************
 34 -33.3***************
 35 -34.3*************
 36 -37.4***********
 37 -41.5**********
 38 -50.2*****
 39 -55.9***
 40 -63.4

    AV-11.9 WH 181/1347 0006

181/1347  MT.NO=33  MODE= CW
```


!

The first two examples were taken from Appendix L scenario, Receiver Noise Figure Degradation - A Versus B, conducted on the 8th of June (see pages 242 through 248), and 14th of June (see pages 354 through 361).

Another illustration of degradation recognition may be found in the test data for Appendix R scenario, RFI and Abnormal Interference, conducted on 13 June 1977 (see pages 283 through 290). Note in this particular scenario that the problem is further identified through use of the display of the hourly statistics file for Receiver A Eye Margin at Ft. Huachuca.

6.1.12 The Fault Location Times as Affected by DATEC

No test scenarios were written especially to demonstrate this facet of DATEC's capability, primarily for one reason. The DATEC system provides the nodal controller with a number of fault detection and isolation capabilities for which there is no manual equivalent. It would be a simple matter then to choose one or more of this type of system anomaly and write scenarios which illustrate this lack of manual capability. Correspondingly, the fault location times would be tremendously impacted by DATEC. Depending on the subtleness of some of the anomalies, they could go unrecognized indefinitely without the use of DATEC.

It is acknowledged that for some types of problems such as those involving hard equipment failures, especially in those cases resulting in loss of service, the communication system is suitably alarmed (either audibly or visually) such that the tech controller receives warning within seconds of a failure. Reaction time in these instances would be comparable if manual versus DATEC-aided isolation was considered.

To illustrate the type of problems which could go unnoticed under manual surveillance for long periods or indefinitely, and the usefulness of DATEC relative to detection and isolation of such anomalies, the following test data is offered.

The test scenario of Appendix L simulated a receiver whose noise figure was steadily degrading. In this scenario conducted on 8 June 1977 (see pages 242 through 248), the tech controller was able to trace the problem using the Eye parameters, Margin and Hits. At the time that he requested Maintenance to lock on the B receiver and check the A receiver at Ft. Huachuca, the system BER was still good. There would have been no warning of this type of problem if the tech controller had been unaided by DATEC until disruption of service when the baseband had degenerated far enough to cause MUX errors and switching. None of the daily, weekly or monthly preventive maintenance checks would have detected this.

6.1.13 The Output Data Relative to its Utility in Optimizing Preventative Maintenance Schedules and the Maintenance Effort of the FKV Type Equipment

At Ft. Huachuca and Site Sibyl radio checks are made at daily, weekly and monthly intervals for preventative maintenance purposes. The check lists for these operations are shown in Figures 6-7, 6-8, and 6-9.

Of these operations, some may be directly accomplished by DATEC, others are effectively checked by inference from data that is measured by DATEC. Power supply voltages may be directly measured via the analog scanners and MAC units. For the field tests, only a few voltages were randomly selected for demonstration purposes. In an actual installation, all key power supply voltages should be monitored.

AGC voltage is another directly measurable quantity. After appropriate conversion, it is displayed as the more useful parameter, RSL Margin, that is, the margin between actual RSL and the PCM threshold, -71 dBm.

Other items such as proper transmit power and frequency, receiver frequency and pilot levels may be verified by inference from the general "health" of the link as noted by observing other DATEC monitored parameters. The best example of this is transmit power. Because a total picture of the operational status of a link is made available to the nodal controller by DATEC, such a problem can be easily detected and isolated. The Appendix M scenario, Transmitter Power Output Problems, was included in the field tests to illustrate this facility. Data for the 14 June execution of this scenario is included in pages 342 through 345.

In this example, the RSL pattern at Site Sibyl was the key. Since it is possible to detect gradual degradation of RSL over a period of time using the trend analysis capability of DATEC, this information can be used for preventive maintenance purposes, before service is disrupted.

Obviously, DATEC cannot generate a curve of RSL versus AGC. However, the purpose of getting this information on a monthly basis is primarily to detect degradation or shifts in receiver performance. As just pointed out, this information is available in DATEC and is continually being updated. The fact that data of this type is being continually monitored and updated points out another aspect of DATEC's usefulness. The purpose of a preventive maintenance program is to check potential problem areas with the objective of detecting degradations which could lead to major problems such as loss of service or even catastrophic failure. Hopeful, the preventive maintenance schedule is such that these degradations are caught as they are

DEB DAILY CHECK LIST

TEST SITE__________ RADIO SER NO__________ MONTH__________ YEAR________

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
A. PRI PWR SPLY	120 V																															
B PRI PWR SPLY	120 V																															
24 V A XMT/RCV	24 V																															
24 V B XMT/RCV	24 V																															
48 V A PRI PWR	48 V																															
48 V B PRI PWR	48 V																															
20 V A XMT/RCV	20 V																															
20 V B XMT/RCV	20 V																															
20 V A ANC	20 V																															
20 V B ANC	20 V																															
A TRANSCEIVER																																
DEV TEST XMT	GREEN																															
DEV TEST RCV *	GREEN																															
XMT FREQ	0+_3																															
XMT PWR	GREEN																															
RCV FREQ	0±3																															
L.O. DRIVE	GREEN																															
RCV A.G.C.																																
B TRANSCEIVER																																
DEV TEST XMT	GREEN																															
DEV TEST RCV *	GREEN																															
XMT FREQ	0+3																															
XMT PWR	GREEN																															
RCV FREQ	0±3																															
L.O. DRIVE	GREEN																															
RCV A.G.C.																																
165 TWT																																
[illegible] CRNT																																
HELIX CRNT																																
HELIX VOLTAGE																																
PWR OUTPUT																																
TIME OF CHCK																																
INITIALS																																

NOTE: IF THE 70Mhz SEL SWITCH IS PLACED IN THE RCV POSITION, A.F.C. ALARMS WILL OCCUR AND THE TRANSMITTR WILL SWITCH OVER.

FIGURE 6-7. CHECK LIST

Note! Enter Actual Reading in Blanks

WEEKLY DATA SHEET (DEB)

EQUIPMENT	SERIAL NR	MODEL (e.g. Preproduction)
MANUFACTURER SITE	ORDER NR N/A	SPECIFICATION NR N/A
TYPE OF TEST AN/FRC 162-165 WEEKLY CHECKLIST		SPECIFICATION PARAGRAPH N/A

Test Jack	Z	Unbal or Bal	Brdg or Term	Nor Level	1st Week	2nd Week	3rd Week	4th Week	5th Week
TRANSCEIVER A									
J1-A PCM	75	Unbal	Term	-46dBm					
J1-A Pilot	75	Unbal	Term	-70dBm					
J2-A SerChan	75	Unbal	Term	-59dBm					
J25-A Pilot	75	Unbal	Term	-70dBm					
J58-A PCM	75	Unbal	Term	-17dBm					
J58-A Pilot	75	Unbal	Term	-41dBm					
J58-A SerChan	75	Unbal	Term	-30dBm					
TRANSCEIVER B									
J1-A PCM	75	Unbal	Term	-46dBm					
J1-A Pilot	75	Unbal	Term	-70dBm					
J2-A SerChan	75	Unbal	Term	-59dBm					
J25-A Pilot	75	Unbal	Term	-70dBm					
J58-A PCM	75	Unbal	Term	-17dBm					
J58-A Pilot	75	Unbal	Term	-41dBm					
J58-A SerChan	75	Unbal	Term	-30dBm					
WECO JACKFIELD									
J36	600	Bal	Brdg	-7dBm					
J12	600	Bal	Brdg	0dBm					
J14	75	Unbal	Term	-15dBm					
J16	600	Bal	Term	-5dBm					
ANCILLARY CARD CAGE									
A S/L/S -2.00V				-2VDC					
B S/L/S -2.00V				-2VDC					

REMARKS (1) Inject a 1MHz test tone in J24 at +2.5 dBm.
(2) The distand end inject a 1MHz test tone in J24 at +2.5 dBm.
(3) Inject a 5KHz test tone in J15 at -15dBm.
(4) The distand end inject a 5KHz test tone in J15 at -15dBm.
(5&6) The distand end inject a 2KHz test tone in J15 at -15dBm.
~~(7) Not in service.~~

DATE	PAGE NR	SIGNATURE	TABLE

STEP-MT Form 48 Supersedes STEP-MT Form 22 31 Aug 70
2 May 72

FIGURE 6-8. CHECK LIST

MONTHLY DATA SHEET (DEB)

EQUIPMENT	SERIAL NR	MODEL (e.g. Preproduction)
MANUFACTURER SITE	ORDER NR N/A	SPECIFICATION NR N/A
TYPE OF TEST AN/FRC 162-165 Monthly Checklist		SPECIFICATION PARAGRAPH N/A

		Month	Month	Month	Month	Month
Test Jack						
TRANSCEIVER A						
Coaxial Coupler	Freq					
	PWR					
WaveGuide Couples (at top of radio)	Freq					
	PWR					
TRANSCEIVER B						
Coaxial Couples	Freq					
	PWR					
WG Couples (at top of radio)	Freq					
	PWR					
ANCILLARY CARD CAGE						
Pilot OSC	Freq					
F.M. Subcarrier	Freq					
AGC VOLTAGE VS RSL						

Attach charts to rear of data sheet

Note! Enter Actual Reading in Blanks

REMARKS			
DATE	PAGE NR	SIGNATURE	TABLE

STEEP-MT Form 48
2 May 72

Supersedes STEEP-MT Form 22 31 Aug 70

FIGURE 6-9. CHECK LIST

developing. The obvious problem is that if some electronic function is going to degrade, it is not going to do so on any particular schedule. A component in the IF strip could start to fail the day after an RSL versus AGC curve was generated as part of monthly preventive maintenance.

With respect to the utility of DATEC's output data relative to optimizing preventative maintenance schedules, it may be said that there would be no fixed schedule regarding the checks that are now being made. Using the performance assessment and trend analysis capabilities of DATEC, degradations would be automatically detected and alarmed upon. Taking units off-line for replacement or repair would be accomplished when a function had degraded to an alarm state. This first level of alarm condition (amber) would naturally be chosen such that it was reached before service had degraded below link performance objectives.

See also Paragraph 6.2.1 for further discussion of this topic as it relates to manning structure.

6.1.14 The Ability of DATEC to Provide Sufficient Information to Determine the Proper Thresholds for Alarm/Parameter Indicators

Alarm thresholds are normally based upon expected performance and then adjusted as required from long-term trend analysis data. The situation at the test link between Ft. Huachuca and Site Sibyl used during these field tests were slightly different. The initial thresholds were established based on expected performance of the equipment or characteristics of the link (medium); but the adequacy of the chosen thresholds was gauged primarily on how well they served the purpose during the System Simulation Scenarios. In either case, there is sufficient data provided to optimize the thresholds. Following is a discussion of how the alarm thresholds were established for the various types of parameters and the considerations that were given relative to their adequacy.

RSL Margin. The site data base tables for RSL versus AGC were developed from actual measurements taken at the site. RSL Margin is the difference between RSL and -71 dBm, the PCM threshold. From observation of the RSL Margin parameters at Ft. Huachuca and Site Sibyl, mean values were chosen as a baseline. It was noted that under normal weather conditions RSL Margin would vary from 1 to 2 dB from these mean values. The amber flag threshold was chosen (somewhat arbitrarily) as 6 dB below the mean value for each radio at each site. The red flag threshold was selected (in an equally arbitrary manner) at 12 dB below the mean. These thresholds were established as they were not because of any significant change in communication systems performance as the threshold values were crossed, but rather to call attention to the fact that RSL Margin was deviating further

and further from the expected link performance. Crossing thresholds, then, merely alerted the operator that received signal levels were not as they should be, based on nominal operation.

The usefulness of these thresholds was displayed in a very practical manner on at least one occasion. At 1445 hours on 15 June 1977, it was noted that RSL Margin for the B receiver at Ft. Huachuca and for the A and B receivers at Sibyl were all approximately 8 dB lower than the baseline values. A sustained wind of about 20 mph was blowing outside (at the Ft. Huachuca antenna tower) at the time. A check of the tower revealed that a flexible waveguide feeding the transmit antenna had split.

Eye Margin and Derived BER (DER BER). These two parameters are covered together because they are both derived from the same input-- eye dispersion voltage-- and because they are both correlated with each other and with measured BER. The amber threshold originally chosen for DER BER was 1×10^{-7}. The amber threshold for Eye Margin was that value of margin corresponding to the Eye Dispersion voltage that resulted in the 1×10^{-7} DER BER value. The red thresholds were based on a dispersion voltage which resulted in a 1×10^{-5} DER BER. The 1×10^{-7} BER is the minimum performance objective for an FKV type link. As the test scenario phase of field tests progressed, it was noted that there was sufficient sensitivity and resolution in the BEM derived parameters to warrant tightening the thresholds for DER BER to 1×10^{-9} and 1×10^{-7} for amber and red, respectively. Eye Margins were correspondingly changed. This resulted, in those scenarios featuring use of Eye parameters, in detection and isolation of perturbations introduced to the communication system before those perturbations induced bit error rates in excess of 1×10^{-7} (see example in Paragraph 6.1.3).

Eye Amplitude. This is another BEM derived parameter which is a negative dc voltage proportional to the RMS baseband power level into the Baseband Active Coupler. Nominally the level at this point is -9 dBm. In both radios tested, a special monitor point for this parameter was provided. This voltage was noted during data base generation for the AN/FRC-162 radio to be relatively stable, and did not vary more than a few tenths of a dB from nominal. The amber and red threshold levels were set at ±0.75 dB from nominal and ±1.5 dB from nominal, respectively. Examination of data taken throughout the remaining phases of field tests indicated that the Eye Amplitude parameter remained constant for the radios at both sites. Based on these observations, the thresholds could have been set tighter-- say ±0.5 dB for amber and ±1.0 dB for red.

Eye Hits. Hits are 3-level partial response errors which are counted by the self-contained EPUT in the BEM. The actual output from the BEM is a negative dc voltage proportional to Eye Hits. Design of the hit counter function in the BEM is such that it begins to detect hits when the Baud error rate reaches 10^{-12}. The hits counting function and the BER as derived by the dispersion meter within the BEM may or may not correlate depending upon the type of noise present. Transient occurrences such as deep fades that cause simultaneous squelches of both receivers will result in a hit count, whereas the DER BER parameter, derived from dispersion voltage, may show no perturbation, depending upon when the dispersion voltage was sampled. The Eye Hits parameter, then, is most useful in detection of transient type disturbances.

The thresholds for Eye Hits were chosen as 0.0222/sec and 1.888/sec for amber and red, respectively. Considering the bit rate of 12.5 Mb/s, this corresponds roughly to 10^{-9} and 10^{-7} bit error rates. These thresholds are more or less arbitrary. It was noted at the start of field tests under normal weather conditions and with no perturbations being deliberately introduced to the communication system, that no hits were ever recorded. Two hits per BEM 90-second sample period, which is what the amber threshold of 0.0222/sec is, therefore seemed to be a logical initial selection. Subsequent field test operations involving the AN/FRC-162 radio did not yield any additional data that warranted changing the thresholds.

It will be noted from examination of the field test scenario data that the Eye Hits parameter never was used in a quantitative manner, but as an indicator of some transient disorder, which as mentioned previously, is its primary function. An example of this may be found in the data from Appendix K, 7 June 1977, a scenario in which single path deep fade was simulated.

When DATEC was tested in conjunction with the DR8A radio, some adjustments to both the Eye Hits parameter thresholds and to the BEM hardware itself were required. The hardware changes are discussed in paragraph 6.1.3 of this section. The threshold changes were required for the same reason, higher system BER, to remain compatible with the level of performance of the communication system. Thresholds chosen for operation with this radio were 8.53 hits/sec and 136 hits/sec for amber and red, respectively. This is roughly equivalent to 10^{-7} and 10^{-5} error rates.

No System Simulation Scenarios were conducted that involved transient perturbations wherein fault detection and isolation might have been facilitated through use of the Eye Hits parameter.

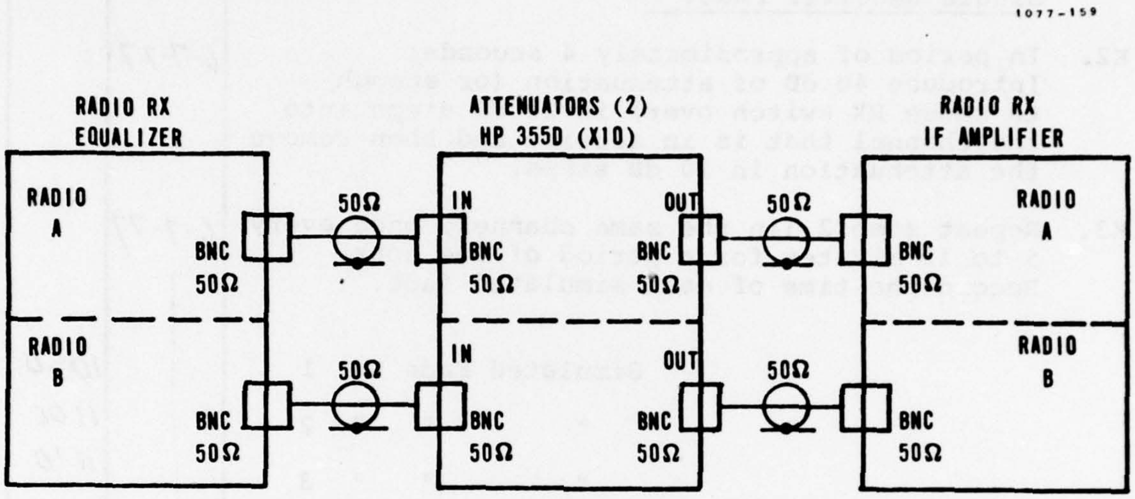
AD-A051 926 HONEYWELL INC ST PETERSBURG FL AVIONICS DIV F/G 17/2
ATEC DIGITAL ADAPTATION STUDY, DEVELOPMENT AND FIELD EVALUATION--ETC(U)
JAN 78 T J CAMPBELL, W F ACKER, C L CHRISTNER F30602-75-C-0282
UNCLASSIFIED 1077-14813-VOL-2 RADC-TR-77-431-VOL-2 NL

3 OF 4
AD
A051926

PROCEDURE	DATE	TIME
K1. At HUA, connect attenuators (X10) between Equalizer and IF in RX A and RX B as shown in Figure K-1.	6-7-77	
Single Receiver FAde: -		
K2. In period of approximately 4 seconds: Introduce 40 dB of attenuation (or enough to cause RX switch over) in 10 dB steps into the channel that is in service and then remove the attenuation in 10 dB steps.	6-7-77	
K3. Repeat step 2 (In the same channel) once every 5 to 10 minutes for a period of one hour. Record the time of each simulated fade.	6-7-77	
Simulated Fade No. 1		1050
" " " 2		1100
" " " 3		1110
" " " 4		1120
BREAK FOR LUNCH → " " " 5		1130
MAINT. ADVISED TO CHECK A RX @ HUA " " " 6		1240
" " " 7		1250
" " " 8		1300
" " " 9		1310
" " " 10		1320
" " " 11		1330
" " " 12		1340

CONDUCTED BY C. L. Christner 6-7-77

OBSERVED BY ______________



* Alternate attenuators which may be used:
Weinschel Engineering, Model 933

Figure K-1. Test Configuration, Link RF Fading

7 June 1977/Page #3

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
System Clear		6/7	1010
Radio switched from "A" to "B" receiver, Link Performance print-out shows [illegible] eye hits on "A" Receiver only, Receiver "B" was good at all times, suspect problems on "A" receiver....	12/7	6/7	1100
Turned problem to maint		6/7	1130
Maint advs there is nothing wrong with the recvr, continueing to try and isolate the problem.. Still have problem with switching to "B" here at HUA...///RR			1320
Based upon Eye hits noted, squechles, and RSL margin drop noted on "A" recvr, during the past hour, believe the problem to be caused by single path fast fading, affecting only the "A" recvr..possibly interference of some kind. No other conclusions can be drawn ATT...////RR			1400
Believe that if the hourly display could be held instead of being dumped into the daily data, after the end of each hour, the problem could have been isolated sooner...If we could arrange the system to only kick out the bottom scan on each parameter, into the daily readout, and keep all others, we would have much more info readily available to us..///RR ///			

TECH CONTROLLER [illegible]

OBSERVED BY [illegible]

12/7

IQ-008 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 158/11[illegible]0:32

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	29.936	26.676	29.142	1.1411	29.652	.21836	--------	--------	DB
A	EYEMAR	13.369	13.278	10.628	2.0067	10.989	2.3534	--------	--------	DB
	RSLAVL	1.0000	.92857	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	293.00	58.618	.02133	.05226	.04112	.04319	--------	--------	/SC
HUA	RSLMAR	29.453	29.291	33.802	1.3026	30.284	2.0800	--------	--------	DB
B	EYEMAR	5.7603	9.7464	9.1157	1.9932	5.5974	2.3299	--------	--------	DB
	RSLAVL	1.0000	.92857	1.0000	--------	.98505	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9971	--------	--------	--------	RATE
	EYEHIT	0.0	52.013	.00125	.00219	4.5383	5.4634	--------	--------	/SC
SBL	RSLMAR	38.500	39.102	37.585	.94111	39.237	1.2267	--------	--------	DB
A	EYEMAR	13.142	13.096	13.146	.44232	12.611	.51716	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9940	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00155	.00347	3.7986	4.1931	--------	--------	/SC
SBL	RSLMAR	32.333	32.365	33.788	1.0273	34.978	.73836	--------	--------	DB
B	EYEMAR	13.831	13.419	13.452	.31095	12.059	1.6250	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9941	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00024	.00054	2.1079	3.6468	--------	--------	/SC

Frame Error Rate (FER - T1-4000 and T1WB1). Thresholds for this parameter were chosen in much the same manner as those for Eye Hits. With the communication system operating under normal conditions, no frame errors were detected from either multiplexer. The initial thresholds for frame error count (for both T1-4000 and T1WB1) were selected as 2 errors per EPUT sample period for amber and 13 for red. This converts to frame error rates of 1.7×10^{-7} (amber) and 1.1×10^{-6} (red) for the T1-4000; and 2.1×10^{-6} (amber) and 1.4×10^{-5} (red) for the T1WB1.

As with Eye Hits, FER was not used during the test scenarios in a strictly quantitative manner. The thresholds as they were set proved to be useful in fault detection and isolation and could be used as shown in the example below from an Appendix U scenario to catch a developing failure.

Note that the FER discrepancy at Sibyl was first recognized when it was actually in the order of 10^{-7} (see Tech Controller's comment at 0942, 8 June 1977, on page 327).

Since the thresholds were used in a more-or-less qualitative fashion, they were not changed from their initial values when the EPUT time base was changed from 2 minutes to 3-1/2 minutes, midway through the System Simulation Scenario test phase, as previously discussed in paragraph 6.1.3. The tech controllers continued to use the original limits and were just as effective in isolating faults.

Maintenance Voltage. The thresholds for Maintenance Voltages were set for in-plant tests at ±5 percent from nominal for amber and ±10 percent from nominal for red. At the start of field tests it was noted that all the voltages that were monitored (6 for each site) except one, the +15 volt power supply for the T1WB1 at Ft. Huachuca, were in the green (no alarm) condition and remained very stable. The T1WB1 +15 volt supply was amber. The equipment manual tolerance for this supply was the same as the DATEC amber tolerance, ±5 percent. It was recognized prior to the start of field tests that it was not feasible to change the communication equipment power supplies incrementally to simulate gradual degradation. Power supplies were disabled completely for the tests either by removal of fuses or opening of circuit breakers. The point here is that analytically derived thresholds for Maintenance Voltage for field tests held little significance, and were in fact not required. For this reason, the tolerances originally chosen for in-plant tests were not changed for the field tests.

From examination of the field test data, it was noted that all power supplies with the exception of the T1WB1 supply previously mentioned were stable to well within 5 percent. The T1WB1 supply varied as much as 12 percent from nominal. No anomalies in operation of the low level MUX were noted which might have been correlated with the +15 volt power supply discrepancy, but as mentioned in previous paragraphs of this section, use of DATEC's long-term trend analyses capabilities was not a primary objective for the field tests; therefore, there may have been instances that were missed. The information for such a correlation to be made was available, nevertheless, on the Link Performance Assessment displays for the T1WB1 and for the Maintenance Voltages, and if examined over a period of time could have been used in making the decision to either retain the thresholds as originally established or perhaps loosen them.

6.1.15 The Recommended Sample Rates for the Most Effective Use of DATEC

In any discussion regarding monitoring of communication systems for the purposes of performance assessment, fault isolation, and trend analysis, the subject of scan time (or sample rate) is sure to evoke the most--and diverse--comment. Discussions with the tech controllers participating in the System Simulation Scenarios proved to be no exception. They all mentioned at one time or another that they felt scan times should be shorter. The merits of higher sample rates will be discussed subsequently, but some comment should be made at this point regarding the tech controllers' views and the circumstances involved during conduction of the scenarios that might have influenced their thinking with respect to this subject.

The System Simulation Scenarios were written and conducted in such a manner that their average duration was less than one hour. The perturbations that were introduced into the communication systems yielded realistic system responses, but as an expedient in getting as much data as possible, the faults were introduced over a period of minutes. Within 15 minutes to a half hour after the tech controllers had obtained their baseline data for an "all green" system operating in the normal manner, the perturbation(s) would be introduced. Except for a test such as that in Appendix S, Special RSL Long Term Test, long term performance assessment and trend analysis was not a part of the scenario objectives. These CPMAS functions were considered, but on a short term basis.

Essentially, then, the tech controllers were in a fault isolation mode from the outset of each scenario. It is quite natural that once a problem is recognized, it is desirable to get as much data as possible in the shortest period of time as possible, in order to isolate the cause and initiate remedial action. Electronic design has progressed to the point today where what we consider to be a reasonable period of time is "instantaneously".

To put the subject of scan time in its proper perspective, a scenario such as that in Appendix L--Receiver Noise Figure Degradation A versus B--should have been conducted such that the simulated degradation to the radio receiver took place over a period of days or even weeks. This would probably have come closer to simulating an anomaly created by an aging component, for instance. Since problems of this type do not cause loss of service--or for that matter even significantly degraded operation--immediately, present scan times might even be considered short.

It is acknowledged that scan times of three and one-half to four minutes for most parameters and seven to eight minutes for BEM processed eye parameters is lengthy if loss of service is involved. However, as was discussed in paragraph 6.1.4, loss

of service alarm information is processed separately from parameters via the SSFSS function, and is available to the operator within seconds of occurrence. Once the operator is alerted via the major alarm and associated minor alarms and two-state status information, he may then enter Monitor Immediate mode and examine parameters in the problem area with an update rate limited only by the hardware processor. For all parameters but two available in Monitor Immediate, this scan rate is just a few seconds. For FER and BEM processed Eye Hits data, the update times are three and one-half minutes and one and one-half minutes, respectively. These times are both established by EPUT sample time bases. (The BEM has a self-contained EPUT function dedicated to Hit counting.) The three and one-half minutes time base for the EPUT which processes frame errors was discussed in paragraph 6.1.3. That time base was changed from two minutes to three and one-half minutes during the Field Test program to match up better with the nodal control scan time to prevent loss of latched transient data. This time base should not be changed; however, a shorter time base for use during Monitor Immediate is a practical suggestion and is feasible. This applies to both the external EPUT and the EPUT function in the BEM. The shorter time bases could be mechanized by using the self-test time bases which are just seconds in duration.

As just stated, the EPUT time bases could be shortened for Monitor Immediate mode and thus improve the fault isolation function, but the DATEC system in its present configuration is not totally ineffective in this respect. Consider the test scenario of Appendix EE, Unrelated Multiple Failures-1, conducted on 29 June 1977. In this scenario 8, unrelated failures were induced in the communication system by perturbations introduced over a period of 34 minutes. The tech controllers isolated these faults in a period of 80 minutes--an average of 10 minutes per fault. Or, consider the data for this scenario conducted on 21 June, (see pages 305 through 310) when only four faults were induced. Total time to isolate these faults was 23 minutes--or between five and six minutes per fault.

UNRELATED MULTIPLE FAILURES - 1

PROCEDURE	DATE	TIME
EE1. AT SBL, INSERT 10 dB OF ATTENUATION IN THE A RECEIVER WAVE GUIDE ATTENUATOR	6/29	0838
EE2. AT SBL, INJECT 2-6 T1-4000 FRAME ERRORS EVERY 2-4 MINUTES USING THE FBEG. THIS IS TO BE DONE WITH THE NORMAL T1-4000 IN SERVICE.		0836
EE3. AT HUA, DISABLE THE NORMAL T1-4000 CHANNEL 7 XMIT CARD BY BREAKING THE CARD EDGE CONNECTIONS TO THE CARD NEST.		0852
EE4. AT HUA, ~~[illegible]~~; ~~[illegible]~~ INJECT 1000 Hz ± 10 Hz AT [illegible] dBm.		0854
EE5. AT HUA, REMOVE THE CONV FUSE FROM THE TIWBI.		0841
~~EE6. UPON COMPLETION OF THE TEST, RETURN ALL CONDITIONS TO NORMAL.~~		
EE6. AT HUA INSERT 40 dB OF ATTENUATION IN THE RECEIVER A 70 MHz IF ATTENUATOR.		0843
EE7. AT HUA, INSERT 20 dB OF ATTENUATION IN THE TX WAVEGUIDE.		0844
EE8. UPON COMPLETION OF THE TEST, RETURN ALL CONDITIONS TO NORMAL.		
EE9. SHUT BOTH WAVEGUIDE SHUTTERS @ SBL @ 0910 opened 0922 REQUESTED TO CHECK SBL'S ANTENNA ALIGNMENT @ 0840 REMOVED ATTENUATION @ 0845. REQUESTED TO XFER TO B XMIT @ SBL @ 0848 REQUESTED ANTENNA ALIGNMENT ON TX @ HUA 0857 REMOVED EE7 @ 0858 REQUESTED CHECKOUT OF A RX @ HUA @ 0857 EE4 CORRECTED @ 0910		0910

CONDUCTED BY D. Thomas Doyle

OBSERVED BY ____________________

DATEC SYSTEM EVALUATION WORKSHEET

29 June 1977 Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Start new day with systems Green...////RR		6/29	0830
Overview showing the "A" ra dio recvr and T1WB1 at SBL amber..///RR ///Showing the "A" RSL at SBL down in the amber region..///RR	1/29 June 77		0840
Requested SBL chker their "A" Recvr antenna Alignment...////RR	1/29 June 77		0843
Overview now showing the "A" Recvr at HUA Red.. also showing a major alarm on the T1WB1's here and at SBL...Requesting in-house loops on the T1WB1's both at HUA a nd SBL..////RR			0844
Display now showing our "B" Recvr amber also..RR LP displays indicates RSL on both recvrs at HUA very low...////RR///Requesting SBL swap to their "B" radio xmitter..////RR	2/29 June 77		0845
Maint advsd the "A" Recvr antenna at SBL was out of alignment..They say this has been corrected..//RR			0848
SBL now on his "B" mitter ...///RR			0849
Display now showing low RSL on all four RECVRS (SBL and HUA)....////RR	3/29 June 77		0851
Maint advs that SBL T1WB1 is good,,, the one at HUA is bad and turned to maint ATT...///RR			0853
Ma int advs of a blown fuse in the T1WB1 here at HUA.. Replaced same..///RR			0854
Requesting SBL chker their Xmit antenna alignment.///RR			0856
SBL alignment good..Requesting HUA chk our xmit antenna alignment...Also requesting maint at HUA chk our "A" Recvr...///RR	3/29 June 77		0857
Ma int at HUA advs our xmit antenna was misaligned.. This has been corrected...////RR			0900
Maint advs the "A" Recvr at HUA had bad IF amp.. Replaced same..///RR			0902
RSL's in both directions have stabilized, and are in the Green...///RR//Overview a gain showing a major alarm on both T1WB1's..///RR//Also showing a xmit chnl problem on our CY-104...////RR			0903

CONT on page # 2..

TECH CONTROLLER ________

OBSERVED BY ________

DATEC SYSTEM EVALUATION WORKSHEET 29 June 77 Pg # 2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Cont from Pg # 1...////RR		6/29	0903
T1WB1's check good...Had maint swap chnl cards on the T1-4000 and the alarms on the T1WB1 cleared.. maint chking cards ATT..///RR			0906
G1 display indicates hot levels from our sub, on the CY-104 chnl.....Requesting maint chker this out..///RR	4/29 June 77		0909
Overview now showing both Recvrs at HUA RFD Flagged... also showing our mux red (due probabley to Recvrs..) Maint advsd of hot levels from sub on CY-104 and this has been corrected..///RR	5/29 June 77		0911
Telemetry down at SBL..///RR	5/29 June 77		0912
Displays indicating a problem with both Recvrs at HUA (voltages are good) but display says they are ba d..Turned both to maint A TT...///RR			0916
Maint advs both Recvrs at HUA are Good..///RR			0918
Having maitnt at SBL chk out their Radio mitters.//RR	6/29 June 77		0919
Ma int advs SBL had had a pwr flop..///RR			0921
Maint advs SBL back up ATT..They went dwon at 0910...///RR			0922
A ll major and hard alarms cleared...only parameter alarms remain..waiting for display to update..//RR			0926
Due to low eye margin, requesting maint at HUA chk our "B" ra dio recvr..///RR	6/29 June 77		0930
Maint says the "B" recvr good..///RR			0931
Parameter alarms at HUA have clared...Rema ing are parameter alarms at SBL...waiting for display updates..///RR			0934
Due to eye hits on the "A" recvr at SBL, requesting they lock on their "B" radio recvr...Also requesting they but their "A" radio mitter back in service..//RR	7/29 June 77		0942
LS display indicating our Eye amplitude on the "A " recv in the Red..///RR	7/29 June 77		0944
Requesting SBL go back to "B" radio mitter and check their "A" transceiver..///RR			0947

CONT on pg # 3

TECH CONTROLLER Cms

OBSERVED BY

DATEC SYSTEM EVALUATION WORKSHEET 29 June 77, Pg #3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Cont from pg # 2..//RR		6/29	0947
(good) Maint advs the "A" transceiver at SBL ..They also advs that eye hits at SBL caused by xmit baseband problem at HUA.. Honeywell now taking control to trblshoot an apparent problem at SBL..///RR			0956
Problems isolated to: 1. Transmit baseband problem at HUA. 2. "A" recvr antenna alignment at SBL. 3. Blown fuse in T1WB1 at HUA 4. Xmit antenna at HUA misaligned. 5. Bad IF a mp in "A" recvr at HUA. 6. Hot customer levels on CY-104 at HUA. 7. Pwr flop at SBL. 8. Bad chnl cards on T1-4000 at HUA. Displays used.. 1. Lp-1 2. Ls-1 3. Overview (for problem indicator.)			
TECH CONTROLLER CmS OBSERVED BY (R)			

#1
29 June 77

```
IO-ØØ7                                    SYSTEM OVERVIEW                    TIME  18Ø/Ø339:45
               HUA        SBL
RAD.O A         .        >IA.
      B         .           .
MUX SW          .           .
     A          .           .
     B          .           .
CY1Ø4           .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
TIWBI           .        >ØIA.
                .           .
                .           .
          ......................
TELEMETRY.          .          .
          .         .          .
SITE      .         .          .
```

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 18Ø/Ø34Ø:36

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	34.ØØØ	33.443	----	----	----	----	----	----	DB
A	EYEMAR	14.3ØØ	13.4Ø1	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	.ØØ833	----	----	----	----	----	----	/SC
HUA	RSLMAR	31.345	28.813	----	----	----	----	----	----	DB
B	EYEMAR	7.24ØØ	6.Ø731	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	.9375Ø	----	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	.Ø839Ø	----	----	----	----	----	----	/SC
SBL	RSLMAR	28.917	28.917	33.425	Ø.Ø	----	----	----	----	DB
A	EYEMAR	11.672	12.191	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	Ø.Ø	----	----	----	----	----	----	/SC
SBL	RSLMAR	36.111	36.111	36.[illegible]	Ø.Ø	----	----	----	----	DB
B	EYEMAR	12.346	12.638	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	Ø.Ø	----	----	----	----	----	----	/SC

#2
29 June 77

```
IQ-ØØ6                                SYSTEM OVERVIEW                    TIME 18Ø/Ø344:11
                 HUA      SBL                               MAJOR ALARM
RADIO A         .RS<     >IA.
      B         .AI<        .
MUX SW          .           .
     A          .        >IA.
     B          .           .
CY1Ø4           .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
                .           .
T1WB1           .RØ1<><>Ø1R.
                .           .
                .           .
             .......................
TELEMETRY.          .           .
             .      .           .
SITE         .      .           .
AS-1
```

LINK PERFORMANCE ASSESSMENT - RADIOS TIME 18Ø/Ø344:55

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	-2.6322	-2.6322	33.443	Ø.Ø	----	----	----	----	DB
A	EYEMAR	13.Ø28	13.Ø28	13.4Ø1	Ø.Ø	----	----	----	----	DB
	RSLAVL	Ø.Ø	Ø.Ø	1.ØØØØ	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.ØØ833	Ø.Ø	----	----	----	----	/SC
HUA	RSLMAR	11.382	11.382	28.813	Ø.Ø	----	----	----	----	DB
B	EYEMAR	7.24ØØ	6.Ø731	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.9375Ø	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	.Ø839Ø	----	----	----	----	----	----	/SC
SBL	RSLMAR	28.917	28.917	38.425	Ø.Ø	----	----	----	----	DB
A	EYEMAR	11.672	12.191	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	Ø.Ø	Ø.Ø	----	----	----	----	----	----	/SC
SBL	RSLMAR	36.111	36.111	36.776	Ø.Ø	----	----	----	----	DB
B	EYEMAR	12.346	12.638	----	----	----	----	----	----	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	----	----	----	----	----	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	----	----	----	----	----	----	RATE
	EYEHIT	289.45	41.35Ø	----	----	----	----	----	----	/SC

#3
29 June 77

MII 12>ZKN=t LINK PERFORMANCE ASSESSMENT - RADIOS TIME 13./Ø3E:1

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	MAJOR ALARM LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	-2.6322	-2.6322	33.443	Ø.Ø	------------				DB
A	EYEMAR	13.Ø28	13.Ø28	13.4Ø1	Ø.Ø	------------				DB
	RSLAVL	Ø.Ø	Ø.Ø	1.ØØØØ	------------					RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	------------					RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø3883	Ø.Ø	------------				/SC
HUA	RSLMAR	11.382	11.382	28.813	Ø.Ø	------------				DB
B	EYEMAR	7.24ØØ	6.Ø731	------------						DB
	RSLAVL	1.ØØØØ	1.ØØØØ	.9375Ø	------------					RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	------------						RATE
	EYEHIT	Ø.Ø	.Ø839Ø	------------						/SC
SBL	RSLMAR	19.989	24.4Ø3	38.425	Ø.Ø	------------				DB
A	EYEMAR	11.781	11.781	12.191	Ø.Ø	------------				DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	------------					RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	------------					RATE
	EYEHIT	.29333	.29333	Ø.Ø	Ø.Ø	------------				/SC
SBL	RSLMAR	16.667	26.389	36.Ø76	Ø.Ø	------------				DB
B	EYEMAR	12.346	12.638	------------						DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	------------					RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	------------						RATE
	EYEHIT	289.45	41.35Ø	------------						/SC

IQ-ØØ7 LINK STATUS TIME 18./Ø857:Ø1

		......T1-4ØØØ...... HUA	SBL		......RADIO...... HUA	SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB	A	
	MAJOR					
STATUS	TX IN SVC	A	A	TX IN SVC	A	B
	RX IN SVC	A	A	RX IN SVC	B	A
	MAINT			MAINT		
PARAMETER	FER	<4.9E-8	.ØØ162 R	RX SQUELCH		
	CRFRM		*	RSL MARGIN	9.75ØØ R	19.989 R
				EYE MARGIN	5.76Ø3	11.781
	BER COR	NO DATA	9.Ø215 R	EYE AMPL	-11.286 R	-5.9677
				EYE HITS	Ø.Ø	.29333 A
				DER BER	9.3E-13	1.3E-12

PAGE 1

#4
29 June 77

!

SI

180/0908

180/0908 MT.NO=00 MODE= 00

CY-104...HUA...CH'S..1&13

```
RH  AV-03.1 TT 180/0908 0005
AV-03.1RH  FR+0097    CN-56.4    SN+53.3    NF-55.4    HD+52.6
VU-03.1    PA+00.0    M1+00.2    M5+00.0    FR+0097    SN+0070

SPECTRUM 6----5----4----3----2----1----0----1
 01 -66.8
 02 -80.1
 03 -87.1
 04 -84.1
 05 -87.1
 06 -73.0
 07 -63.0
 08 -50.1*****
 09 -08.8****************************
 10 -03.1********************************
 11 -09.5****************************
 12 -51.1*****
```

180/0908 MT.NO=00 MODE= 00

!

#5 29 June 77

```
M'C-3-07-12                      SYSTEM OVERVIEW                   TIME  180/0909:
                 HUA      SBL
RADIO A         .RS<       .
      B         .RI<       .
MUX SW          .R<>       .
     A          .R<>     >IA.
     B           .         .
CY104           .A01>      .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
T1WB1           .R01<>  >01A.
                 .         .
                 .         .
                 .         .
            .....................
TELEMETRY.          .          .
          .          .          .
SITE      .          .          .
```

```
MAC-3-13-17                     SYSTEM OVERVIEW                   TIME  18_/0911:49
                 HUA      SBL
RADIO A         .RS<       .
      B         .RI<       .
MUX SW          .R<>       .
     A          .R<>     >IA.
     B          .R<>       .
CY104           .A01>      .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
                 .         .
T1WB1           .R01<>  >01A.
                 .         .
                 .         .
                 .         .
            .....................
TELEMETRY.          .     R    .
          .          .          .
SI.       .          .          .
```

#6
29 June 77

IQ-008 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 180/0919:20

MAJOR ALARM

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	-9.0000	2.3955	33.443	0.0	-	-	-	-	DB
A	EYEMAR	13.028	13.028	13.401	0.0	-	-	-	-	DB
	RSLAVL	0.0	.20000	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	0.0	0.0	.00883	0.0	-	-	-	-	/SC
HUA	RSLMAR	-9.0000	10.428	28.813	0.0	-	-	-	-	DB
B	EYEMAR	-29.100	-5.0628	6.0731	0.0	-	-	-	-	DB
	RSLAVL	0.0	.80000	.93750	-	-	-	-	-	RATE
	EYEAVL	0.0	.66667	1.0000	-	-	-	-	-	RATE
	EYEHIT	0.0	0.0	.08390	0.0	-	-	-	-	/SC
SBL	RSLMAR	39.000	31.701	38.425	0.0	-	-	-	-	DB
A	EYEMAR	11.781	11.781	12.191	0.0	-	-	-	-	DB
	RSLAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	.29333	.29333	0.0	0.0	-	-	-	-	/SC
SBL	RSLMAR	36.111	31.333	36.076	0.0	-	-	-	-	DB
B	EYEMAR	13.028	13.028	12.633	0.0	-	-	-	-	DB
	RSLAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	289.45	41.350	-	-	-	-	-	-	/SC

MAC-1-07-12 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 180/0930:32

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	32.340	10.937	33.443	0.0	-	-	-	-	DB
A	EYEMAR	15.254	14.141	13.401	0.0	-	-	-	-	DB
	RSLAVL	1.0000	.42857	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	0.0	0.0	.00883	0.0	-	-	-	-	/SC
HUA	RSLMAR	30.033	16.029	28.813	0.0	-	-	-	-	DB
B	EYEMAR	-29.100	-5.0628	6.0731	0.0	-	-	-	-	DB
	RSLAVL	1.0000	.85714	.93750	-	-	-	-	-	RATE
	EYEAVL	0.0	.66667	1.0000	-	-	-	-	-	RATE
	EYEHIT	0.0	0.0	.08390	0.0	-	-	-	-	/SC
SBL	RSLMAR	38.400	33.041	38.425	0.0	-	-	-	-	DB
A	EYEMAR	12.346	12.064	12.191	0.0	-	-	-	-	DB
	RSLAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	364.00	132.19	0.0	0.0	-	-	-	-	/SC
SBL	RSLMAR	36.111	32.289	36.076	0.0	-	-	-	-	DB
B	EYEMAR	12.800	12.914	12.633	0.0	-	-	-	-	DB
	RSLAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEAVL	1.0000	1.0000	1.0000	-	-	-	-	-	RATE
	EYEHIT	289.45	41.350	-	-	-	-	-	-	/SC

#7
29 June 77

```
F00MAC-qAC-                    LINK PERFORMANCE ASSESSMENT - RADIOS              TIME  1
            LAST   LAST HR   LAST 24 HR        LAST 30 DAYS       LAST 30 MTHS
            SCAN    MEAN     MEAN    DEV        MEAN    DEV        MEAN    DEV
HUA RSLMAR 32.240  32.240   23.521  9.9216 -------------------------------- DB
 A  EYEMAR 15.254  14.141   13.401     0.0 -------------------------------- DB
    RSLAVL 1.0000  1.0000   .83333 ---------------------------------------- RATE
    EYEAVL 1.0000  1.0000   1.0000 ---------------------------------------- RATE
    EYEHIT    0.0     0.0   .00083     0.0 -------------------------------- /SC
HUA RSLMAR 29.957  29.957   23.297  5.5167 -------------------------------- DB
 B  EYEMAR 8.0479 -1.7851   6.0731     0.0 -------------------------------- DB
    RSLAVL 1.0000  1.0000   .91667 ---------------------------------------- RATE
    EYEAVL 1.0000  .75000   1.0000 ---------------------------------------- RATE
    EYEHIT    0.0     1.0   .00394     0.0 -------------------------------- /SC
SBL RSLMAR 33.700  33.984   33.425     0.0 -------------------------------- DB
 A  EYEMAR 12.346  12.064   12.191     0.0 -------------------------------- DB
    RSLAVL 1.0000  1.0000   1.0000 ---------------------------------------- RATE
    EYEAVL 1.0000  1.0000   1.0000 ---------------------------------------- RATE
    EYEHIT 364.09  182.19      0.0     0.0 -------------------------------- /SC
SBL RSLMAR 35.833  32.880   36.076     0.0 -------------------------------- DB
 B  EYEMAR 13.369  13.066   12.639     0.0 -------------------------------- DB
    RSLAVL 1.0000  1.0000   1.0000 ---------------------------------------- RATE
    EYEAVL 1.0000  1.0000   1.0000 ---------------------------------------- RATE
    EYEHIT    0.0     0.0   41.359     0.0 -------------------------------- /SC
```

```
MAC-3-01-06                   LINK STATUS                             TIME  180/0944:
                           ......T1-4000......                        .......RADIO......
                              HUA        SBL                           HUA         SBL
ALARM        SW MAJOR                .               TX PROB                 .
             SW MINOR                .               RX PROB                 .
             MAJOR                   .                                       .
STATUS       TX IN SVC        A      .    A          TX IN SVC        A      .     A
             RX IN SVC        A      .    A          RX IN SVC        A      .     B
             MAINT                   .               MAINT                   .
PARAMETER    FER          <4.9E-3    .  .00127 R     RX SQUELCH              .
             CRFRM                   .    *          RSL MARGIN     32.240   .  35.833
                                                     EYE MARGIN     15.254   .  13.369
             BER COR      NO DATA    .INVLD          EYE AMPL      -11.048 R.  -8.9677
                                                     EYE HITS          0.0   .     1.0
                                                     RCR BER       1.2E-14   .  6.2E-13
                                                                              PAGE 1
```

6.1.16 The Communication System Operations During Degraded/Normal Operating Conditions of the DATEC System

Appendix J of the Field Test Plan/Procedures document addressed this item specifically. All DATEC monitor point connections to the communication system are either to relay contacts which are provided for this purpose or are effectively bridge-on type connections. In the latter case, to assure that in the event the active monitoring circuits in DATEC should short to ground for some reason, isolation resistors are provided to limit current to a value which will not degrade the operation of the communication system. The procedures of Appendix J verified the fail-safe aspects of monitor circuits falling into this latter category. Results of these tests indicated that when simulated failures were made to occur in the various monitoring functions of DATEC, the communication system continued to operate without alarm or degradation.

Normal operation of the communication system prior to degrading the DATEC system (i.e., normal operating conditions of the DATEC system) was verified during the initial steps of Appendix J.

The procedure and data collected during this field test is included on pages 429 through 453 following.

APPENDIX J

OPERATION WITH DEGRADED CONDITIONS

1. PURPOSE

The purpose of this test is two-fold: (1) to demonstrate what effect, if any, a degraded DATEC System has on a normally operating communication system, and (2) to demonstrate operation of the DATEC system when both DATEC and communication system are in degraded condition.

2. BACKGROUND

All DATEC connections, with the exception of power supply voltages, Baseband Eye Monitor (BEM) Couplers and Event Per Unit Time (EPUT) Remote Buffers, are to relay contacts in the communication system. No adverse effects can be caused by DATEC degraded operation for relay contact monitoring, therefore; the first part of this test will address only the active signals monitored by DATEC to demonstrate what effect on a normally operating communication system, degradation of DATEC will have.

All power supply voltages are monitored through a series resistance. In those cases where scaling is required, there is also a shunt resistor forming a voltage divider. Failure will be simulated by shorting the monitored side of the series resistor to ground.

The baseband Eye Monitor connection is to the AN/FRC-162 RCV LO LVL output via the Baseband Active Coupler. Failure will be simulated by removal of power from the Coupler.

EPUT Remote Buffers connect directly to T1-4000 and T1WB1 logic signals. The buffers present a minimum impedance of 10,000 ohms. Failure will be simulated by removal of power from the Buffer.

The second phase of this test will deal with situations wherein both the communication system and DATEC are degraded.

Because of the complexity involved, the most likely candidate for DATEC degradation/failure is the nodal control function consisting of the ADDS console, H-316R computer and Disc. Failure in this area eliminates the facility of automatically scanning and displaying (via CRT) site status. However, there are several ways (work-around-methods) of collecting and displaying data which may be employed while repair work is being done on the nodal controller. Although the automatic collection and display of alarms via the nodal controller has been lost, the SSFSS is fully operative. Local hardware display

of both nodal and remote alarms will be demonstrated. Use of the MAC in the local mode and use of the TermiNet printer patched into the 150 Baud party line to control and collect/display data via the Measurement and Acquisition Control (MAC) will be demonstrated.

If the EPUT fails, there is no backup mode; therefore, data such as BEM parameters, T1-4000 and T1WB1 frame errors and reframes, and radio receiver squelch information will be lost. However, the EPUTS have a local self-test function and modular construction which will provide quick fault isolation and repair capability.

If a BEM fails, baseband quality data (Dispersion, Hits and Eye Amplitude voltages) for the radio involved will be lost; however, the basic fault detection/isolation indications such as alarms and the remaining equipment parameters are intact.

Failure of an Alarm Scanner means that part or all of the hard equipment alarms and two-state status indication for that particular scanner is lost, but the PATE can still analyze parameter data and display alarm threshold violations. Local self-test and modular construction facilitate fault isolation/repair.

Loss of an Analog Scanner means that part or all of the voltage measurements routed via that scanner will be lost, but hard equipment alarms and two-state status information is still available. Like the Alarm Scanner and EPUT, local self-test and modular construction facilitates fault isolation/repair.

If a MAC fails, remote automatic parameter scanning capability is lost, but via Analog Scanner local control, the voltage(s) to be monitored may be selected and are available at the measurement bus jacks of the Jack Panels. Also BEM Dispersion voltage and Eye Amplitude are available at the front panel of the BEM. Demonstration of the former will be made during the test.

If the Master Alarm Display (MAD) is inoperative, no alarm or two-state status information is available to the PATE (from either site), and therefore CRT display of this data is lost. However, alarm/two-state status information may be observed locally at each site on the Alarm Scanners, and this information (for both sites) is displayed at the nodal Alarm Displays, as will be demonstrated during the test.

Finally, failure of the modems used for telemetry will be considered. Tests will show retention of fault detection/isolation capability even though one of the two modems is lost. First, the 150 baud unit will be removed and fault detection/isolation will be illustrated using only hard equipment alarm/two-state status information. Then, with only the 75 Baud unit disabled, fault detection/isolation will be demonstrated using parameter information conveyed via the 150 Baud modem.

3. OBJECTIVE

The objective of this test is to demonstrate that degraded conditions of the DATEC equipment will not interfere with normal operation of the communication equipment; and further, that even though in a degraded state, it is possible to use DATEC to fault detect and isolate degradation of the communication system.

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J1. Verify that link status is normal (i.e., no equipment alarms; no perturbations being introduced).	All communication equipment indications normal	---	✓	
	No alarms at DATEC Alarm Scanners, Alarm Displays or MAD.	---	✓	
J2. At ADDS, enter NC, SN. After 9 minutes observe SYSTEM OVERVIEW.	No alarms	---	✓	
J3. At ADDS, enter NC, LS, 1, 1. Observe LINK STATUS, PAGE 1.	No alarms; all parameters in green flag range.	---	✓	
J4. At ADDS, enter NC, LS, 1, 2. Observe LINK STATUS, PAGE 2.	No alarms; all parameters in green flag range.	---	✓	
J5. At ADDS, enter NC, MV, HUA. Observe MAINTENANCE VOLTAGES-HUA. Record the value of the T1WB1 +15 Vdc displayed.	All voltages normal; flag status green (G). NOTE:- T1WB1 +15V MAINT. VOL. READS 16.7 (R) - THIS IS OUT-OF-TOL BECAUSE THE T1WB1 SUPPLY ITSELF IS HIGH. SEE NOTE IN STEP 7 BELOW.	---	✓	
J6. At ADDS, enter NC, MV, SBL. Observe MAINTENANCE VOLTAGES-SBL.	All voltages normal; flag status green (G)	---	✓	
J7. At HUA EPUT, connect a jumper wire from TB1-81 to TB1-83, and a DVM to read T1WB1 +15 Vdc. (High to TB1-84; low to TB1-83)	DVM reads +15 Vdc 16.64 V. Note: T1WB1 +15 VOLT POWER SUPPLY IS OUT-OF-TOLERANCE, SHOULD BE +15±0.75 VOLTS clc	±1 V	✓	
J8. At ADDS, enter NC, SN. Wait 5 minutes; observe SYSTEM OVERVIEW.	No alarms in T1WB1 field	---	✓	

TEST ACCEPTANCE

HONEYWELL DATE

GOVERNMENT DATE

J2
5/18

CHECKED dlc

```
AS-2                                        SYSTEM OVERVIEW                  TIME  001/0121:52
                 HUA          SBL
RADIO A           .            .
      B           .            .
MUX SW            .            .
     A            .            .
     B            .            .
CY104             .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
T1WB1             .            .
                  .            .
                  .            .
              ........................
TELEMETRY.          .            .
         .          .            .
SITE     .          .            .
```

J3

IQ-ØØ7 LINK STATUS TIME ØØ1/Ø122:53

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	5.3E-7	.	1.ØE-15	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	37.462	.	39.5ØØ
					EYE MARGIN	1Ø.679	.	13.482
	BER COR DIF	5.1913	.	-2.1335	EYE AMPL	-7.Ø882	.	-9.Ø741
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	5.ØE-12	.	1.4E-13

PAGE 1

J4

```
IQ-ØØ8                               LINK STATUS                           TIME  ØØ1/Ø123:35
                           ......CY-1Ø4......                        ......T1WB1......
                            HUA          SBL                             HUA       SBL
   ALARM          SERVICE          .                 OFFICE                 .
                                   .                                        .
                                   .                                        .
                  REMOTE           .                                        .
                                   .                                        .
                                   .                                        .
   STATUS         MAINT            .                 MAINT                  .
                                   .                                        .
                                   .                                        .
   PARAMETER      CHANNEL          .                 FER       1.2E-14      .  1.2E-14
                                   .                 REFRAME                .
                                   .
   SITE           ENTRY            .
   ALARMS         FIRE             .
                  AC PWR           .
                  BATTERY          .
                  W.A. PR          .
                  W.G. HV          .
                  FLOOD            .                                        PAGE 2
```

J5

AS-1 MAINTENANCE VOLTAGES - HUA TIME 001/0124:09

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	TIWBI+15	16.7	R	16.5	15.7	15.0	14.2	13.5			
02	TIWBI+12	12.4	G	13.2	12.6	12.0	11.4	10.8			
03	TI4000+5	4.96	G	5.50	5.25	5.00	4.75	4.50			
04	TI4000-6	-6.08	G	-5.40	-5.70	-6.00	-6.30	-6.60			
05	RADIO+24	24.0	G	26.4	25.2	24.0	22.8	21.6			
06	RADIO-20	-19.9	G	-18.0	-19.0	-20.0	-21.0	-22.0			

J-6

MAC-3-07-12 MAINTENANCE VOLTAGES - SBL TIME 001/0125:09

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
01	T1WB1+15	15.1	G	16.5	15.7	15.0	14.2	13.5			
02	T1WB1+12	12.3	G	13.2	12.6	12.0	11.4	10.8			
03	T14000+5	4.94	G	5.50	5.25	5.00	4.75	4.50			
04	T14000-6	-6.03	G	-5.40	-5.70	-6.00	-6.30	-6.60			
05	RADIO+24	24.1	G	26.4	25.2	24.0	22.8	21.6			
06	RADIO-20	-20.1	G	-18.0	-19.0	-20.0	-21.0	-22.0			

J-8

```
BEM-I-M0-I2                              SYSTEM OVERVIEW                    TIME  001/0128:30
                  HUA          SBL
RADIO A            .            .
      B                         .
MUX SW             .            .
     A             .            .
     B             .            .
CY104              .            .
                   .            .
                   .            .
                   .            .
                   .            .
                   .            .
                   .            .
TIWBI              .            .
                   .            .
                   .            .
            ...........................
TELEMETRY.             .            .
SITE        .          .            .
```

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J9. At ADDS, enter NC, LS, 1, 2. Observe LINK STATUS, PAGE 2.	No alarms in T1WB1 field	---	✓	
J10. At ADDS, enter NC, MV, HUA Observe MAINTENANCE VOLTAGES-HUA	In T1WB1 +15 Vdc field: VALUE 0.0 C R	±0.2 V	✓	
J11. Remove jumper wire installed in step 7.	---	---	---	
J12. After determining which radio is in-service at HUA, remove power to the Baseband Active Coupler in that channel.	---	---	---	
J13. At ADDS, enter NC, SN. When EPUT-1-0 appears in upper left corner of CRT display, interrupt scan and enter NC, LS, 1, 1. Observe LINK STATUS, PAGE 1. Also, note condition of the T1-4000 channel in service.	No equipment or parameter alarms in T1-4000 field of LINK STATUS, PAGE 1.	---	✓	
	Front panel indications of in-service T1-4000 are normal	---	✓	
J14. Restore power to Baseband Active Coupler.	---	---	---	
J15. At HUA remove power from EPUT Buffer Boxes, #1, #2 and #4.	---	---	---	

TEST ACCEPTANCE

HONEYWELL DATE

GOVEPNMENT DATE

J-9

```
MAC-3-01-06                        LINK STATUS                        TIME  001/0129:41
                             .......CY-104......                 ......T1WB1......
                                HUA        SBL                      HUA        SBL
   ALARM        SERVICE              .                OFFICE              .
                                     .                                    .
                REMOTE               .                                    .
                                     .                                    .
   STATUS       MAINT                .                MAINT               .
                                     .                                    .
   PARAMETER    CHANNEL              .                FER      1.2E-14 .  1.2E-14
                                     .                REFRAME             .
   SITE         ENTRY                .
   ALARMS       FIRE                 .
                AC PWR               .
                BATTERY              .
                W.A. PR              .
                W.G. HV              .
                FLOOD                .                                  PAGE 2
```

J-10

MAC-1-18-23 MAINTENANCE VOLTAGES - HUA TIME ØØ1/Ø131:33

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	Ø	R	16.5	15.7	15.Ø	14.2	13.5			
Ø2	T1WB1+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8			
Ø3	T14ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø			
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø			
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6			
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø			

J-13

MAC-3-01-06 LINK STATUS TIME Ø01/0145:20

		......T1-4ØØØ......				......RADIO......		
		HUA		SBL		HUA		SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.		RX PROB		.	
	MAJOR		.				.	
STATUS	TX IN SVC	A	.	A	TX IN SVC	A	.	A
	RX IN SVC	A	.	A	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	1.ØE-15	.	1.ØE-15	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	37.337	.	36.9ØØ
					EYE MARGIN	15.29Ø	.	13.142
	BER COR DIF	1.9E-6	.	-2.3382	EYE AMPL	-17.ØØØ	.	-9.Ø741
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.ØE-15	.	2.2E-13

PAGE 1

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J16. At ADDS, enter NC, SN. When EPUT-1-0 appears in upper left corner of CRT display, interrupt scan and enter NC, LS, 1, 1. Observe LINK STATUS, PAGE 1. Also note condition of the T1-4000 channel in service.	No equipment alarms in T1-4000 field of LINK STATUS, PAGE 1.	---	✓	
	Front panel indications of in-service T1-4000 are normal	---	✓	
J17. At ADDS, enter NC, LS, 1, 2. Observe LINK STATUTS, PAGE 2. Also note condition of T1WB1	No OFFICE alarm in T1WB1 field of LINK STATUS, PAGE 2.	---	✓	
	Front panel indications of T1WB1 are normal	---	✓	
J18. Restore power to HUA EPUT Buffer Boxes.	---	---	---	---
J19. At HUA, perform the following steps: • Turn ADDS console power OFF. • Place H-316R MA-SI-RUN switch in SI (center) position. • At PATE Jack Panel, connect patch cords between "TN" and "232" (top and bottom row of jacks); between "188" on top row and "MAC" on bottom row;	---	---	---	---

TEST ACCEPTANCE

HONEYWELL DATE

GOVERNMENT DATE

J-16

AS-2 LINK STATUS TIME ØØ1/Ø159:15

		......T1-4ØØØ......			......RADIO......	
		HUA	SBL		HUA	SBL
ALARM	SW MAJOR			TX PROB		
	SW MINOR			RX PROB		
	MAJOR					
STATUS	TX IN SVC	B	A	TX IN SVC	A	A
	RX IN SVC	B	A	RX IN SVC	A	A
	MAINT			MAINT		
PARAMETER	FER	2.4E-9	1.ØE-15	RX SQUELCH		
	CRFRM	*		RSL MARGIN	37.462	36.9ØØ
				EYE MARGIN	11.23Ø	13.142
	BER COR DIF	2.9779	-2.3382	EYE AMPL	-7.Ø882	-9.Ø741
				EYE HITS	Ø.Ø	Ø.Ø
				DER BER	2.5E-12	2.2E-13

PAGE 1

J-17

MAC-3-01-06 LINK STATUS TIME 001/0200:17

		......CY-104......			......T1WB1......	
		HUA	SBL		HUA	SBL
ALARM	SERVICE			OFFICE		
	REMOTE					
STATUS	MAINT			MAINT		
PARAMETER	CHANNEL			FER	2.2E-6	1.2E-14
				REFRAME	*	
SITE ALARMS	ENTRY					
	FIRE					
	AC PWR					
	BATTERY					
	W.A. PR					
	W.G. HV					
	FLOOD					

PAGE 2

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J19. (Cont'd)				
and between "MAC" on top row and "188" on bottom row.				
J20. At SBL pull CONV fuse from T1WB1	At HUA note the following:			
	Audible alarm actuates			
	SBL Alarm Display -			
	. T1WB1 LED (blinking)	---	✓	
	. MAJOR ALARM lamp ON	---	✓	
	. ALARM lamp ON	---	✓	
	. NON ACK lamp ON	---	✓	
	MAD (Alarm Scanner Column 2) -			
	. MAJOR ALARM lamp ON	---	✓	
	. ALARM lamp ON	---	✓	
	. NON ACK lamp ON	---	✓	
J21. Turn HUA MAD POWER switch OFF	Audible alarm still operating	---	✓	
	All SBL Alarm Display indications remain as in step 20.	---	✓	
J22. Turn HUA MAD POWER switch ON.	---	---	---	---
J23. Turn audible alarm off; momentarily depress ACK pushbutton on SBL Alarm Display	---	---	---	---

TEST ACCEPTANCE

HONEYWELL DATE

GOVFRNMENT DATE

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J24. At TermiNet printer, verify that unit is ON LINE, Rate switch is set to LOW, Transparency is OFF; then at keyboard enter: Control S 3 D 1 / 1 8 / 1 9 \\ G	TermiNet prints: 0018 O V 0019 O V	 ±0.2 V ±0.2 V	 ✓ ✓	
J25. At SBL, replace CONV fuse in T1WB1	---	---	---	---
J26. At the SBL MAC panel: • Place MAC CONTROL SELECT switch to the left (PANEL ONLY) position • Under SCANNER CONTROL, depress CONNECT push-button switch and set in an ADDRESS of 18.	+7.52 MAC ANALOG MEASUREMENT reads +07.500 VOLTS lamp ON	 ±0.5 V ---	 ✓ ✓	

TEST ACCEPTANCE

HONEYWELL DATE

GOVEPNMENT DATE

J-24

3D1/18/19\G
Ø018 +ØØ.Ø32V
Ø019 +ØØ.Ø31V \~

J-29
5/18/77

3D1/18/18\G#

3D1/18/19\G
Ø018 +Ø7.55V
Ø019 +Ø6.18V \u

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J26. (Cont'd)				
• Under FUNCTION, depress DC pushbutton switch.				
J27. Change MAC ADDRESS to 19	MAC ANALOG MEASUREMENT reads +6.000 +6.18 VOLTS lamp ON	±0.75 V ---	✓ ✓	
J28. Place MAC CONTROL SELECT switch to the right position.	---	---	---	---
J29. At TermiNet keyboard, make same entry as in step 24.	TermiNet prints: 0018 +07.50V 0019 +06.00V	 ±0.5 V ±0.4 V	 ✓ ✓	
J30. At HUA remove patchcards from Jack Panel, turn ADDS console ON, return TermiNet switches to original positions before step 24, initialize H-316R computer, and turn the Audible Alarm switch ON.	---	---	---	---
J31. At SBL, disconnect ~~[illegible]~~ J7 at rear of ~~turn~~ MAC ~~Power~~ Panel chassis ~~Supply POWER switch OFF~~	---	---	---	---

TEST ACCEPTANCE

HONEYWELL DATE

GOVERNMENT DATE

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J32. Drop the front, hinged panel of the SBL EPUT, place the LOCAL-REMOTE switch in the LOCAL position, set in address 18 and momentarily depress the EXEC pushbutton switch. Using a DVM, read the voltage at the "AT" jack of the SBL Jack Panel.	DVM reads +7.50 Vdc +7.56	±0.5 V	✓	
J33. At SBL EPUT, place the LOCAL-REMOTE switch in the REMOTE position; close and secure the front panel.	---	---	---	---
J34. Place the SBL MAC Power Supply switch ON.	---	---	---	---
J35. At SBL, pull the 150 BAUD modem card.	---	---	---	---
J36. At the SBL Maintenance Panel, place the SITE ALARM switch ON.	At HUA note the following:			
	Audible alarm actuates	---	✓	
	SBL Alarm Display -			
	. SITE LED (blinking)	---	✓	
	. MAJOR ALARM lamp ON	---	✓	
	. ALARM lamp ON	---	✓	
	. NON ACK lamp ON	---	✓	
	MAD (Alarm Scanner column 2) -			
	. MAJOR ALARM lamp ON	---	✓	
	. ALARM lamp ON	---	✓	
	. NON ACK lamp ON	---	✓	✓ HUA (See Hardware Log, Page 2, item 6 - [illegible])

TEST ACCEPTANCE

HONEYWELL ____________ DATE ____________

GOVERNMENT ____________ DATE ____________

PROCEDURE	REQUIREMENT	TOLERANCE	PASS	FAIL
J37. Turn audible alarm off; momentarily depress ACK pushbutton on SBL Alarm Display	---	---	---	---
J38. At ADDS, enter NC, SN. Wait 30 seconds, then observe SYSTEM OVERVIEW.	HUA SBL TELEMETRY — R SITE — R	--- ---	✓ ✓	
J39. At SBL, replace the 150 BAUD modem card, pull the 75 BAUD card and place the SITE ALARM switch on the Maintenance Panel OFF.	---	---	---	---
J40. At SBL, momentarily close the RADIO RX A waveguide shutter, then momentarily close the RADIO RX B waveguide shutter.	---	---	---	---
J41. At ADDS, enter NC, SN. When MAC-1-07-12 appears in upper left corner of CRT display, interrupt scan and enter NC, LS, 1, 1. Observe LINK STATUS, PAGE 1.	In RADIO field: HUA SBL PARAMETER RX SQUELCH — *	---	✓	
J42. Restore equipment to baseline configuration.	---	---	---	---

TEST ACCEPTANCE

HONEYWELL DATE

GOVERNMENT DATE

J38
5/18/77

```
                 MAC-1-Ø1-Ø6                                SYSTEM OVERVIEW              TI
                HUA           SBL
RADIO A          .             .
      B          .             .
MUX SW           .             .
     A           .             .
     B           .             .
CY1Ø4            .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
                 .             .
T1WB1            .             .
                 .             .
                 .             .
     ...........................
TELEMETRY.           .         R    .
         .           .              .
SITE     .           .         R    .
```

JA1
5/18/77

AS-1		LINK STATUS			TIME	001/0218:13	
					MAJOR ALARM		
		......T1-4000......				......RADIO......	
		HUA	SBL			HUA	SBL
ALARM	SW MAJOR				TX PROB		
	SW MINOR				RX PROB		
	MAJOR						
STATUS	TX IN SVC	A	A		TX IN SVC	A	A
	RX IN SVC	A	A		RX IN SVC	A	A
	MAINT				MAINT		
PARAMETER	FER	1.0E-15	1.0E-15		RX SQUELCH		*
	CRFRM				RSL MARGIN	37.462	36.900
					EYE MARGIN	10.899	13.142
	BER COR DIF	-3.5830	-2.3382		EYE AMPL	-7.0882	-9.0741
					EYE HITS	0.0	0.0
					DER BER	3.8E-12	2.2E-13

PAGE 1

6.1.17 The DATEC System Operations During Degraded Conditions of Both the Communications System and the DATEC System

The latter part of Appendix J of the Field Test Plan/Procedures document demonstrates the capability of DATEC to provide information to the operator responsible for nodal control that will allow him to detect and isolate communication system faults even though one or more of the DATEC functions is degraded or inoperable. Below is a table which summarizes the procedures of Appendix J relative to this subject which should serve to guide the reader with regard to: (1) the intent of the various steps, and (2) evaluation of the test output data.

Operation	Expected Results	Purpose of Demonstration
J19. ADDS is turned off; computer is halted; patch TermiNet to PATE "Party Line".	No automatic scan or CRT readout.	Simulates loss of computer.
J20. Pull CONV. fuse from T1WB1.	Fails T1WB1. SBL alarm Display, MAD and audible alarm all give indication of major alarm.	With DATEC in degraded condition, fault detection and isolation information is still given when Communication system is placed in degraded condition.
J21. Turn HUA MAD power switch off.	Disables MAD.	With DATEC in a further state of degradation, the alarm display and audible alarm give detection/isolation information.
J24. Command code entered via TermiNet keyboard.	Printout of T1WB1 Maintenance voltages.	Without the use of the computer, it is still possible to fault isolate--in this case, to a module within the faulty communication system unit at a remote site.
J26, J27. MAC at SBL placed in PANEL mode; T1WB1 voltages are selected.	Readout of T1WB1 voltages.	Demonstrates still another means of getting information relative to communication system operation.
J29. Same as step J24.	Same as step J24.	Verifies that fault has been repaired.

Operation	Expected Results	Purpose of Demonstration
J31. MAC at SBL is disabled.	Prevents MAC from automatically processing EPUT data.	Further degradation of DATEC.
J32. EPUT placed in local mode; T1WB1 voltage is selected.	Readout of T1WB1 voltage.	Demonstrates still another means of getting information relative to communication system operation.
J35. Pull 150 BAUD modem card at SBL.	Disables 150 BAUD telemetry line from SBL.	Simulates loss of that part of telemetry which handles parameter data.
J36. Place SITE ALARM switch ON at SBL.	Simulates site alarm. SBL Alarm Display, MAD and audible alarm all give indication of major alarm.	Demonstrates that even with half of telemetry system down, fault detection and isolation information is still available regarding anomaly at remote site.
J39. Replace 150 BAUD modem card at SBL; remove 75 BAUD card.	Disables 75 BAUD telemetry line from SBL.	Simulates loss of that part of telemetry which handles hard alarm and two-state status information.
J40. Momentarily close waveguide shutters at SBL.	Causes momentary receiver squelches; squelch displayed on Link Status display, page 1.	Demonstrates that even with half of telemetry system down, fault detection and isolation information is still available regarding anomaly at remote site.

In addition to the validation test of Appendix J, System Simulation Scenarios were conducted with tech controllers using Appendix CC procedures demonstrating use of DATEC in a degraded condition. The tech controllers were given a short course of instruction in the use of the TermiNet patched into the PATE party line prior to conduction of these scenarios. At the start of each scenario, the computer was placed in Single Instruction mode to simulate PATE failure, and then subsequently a fault or faults were caused in the communication system. The scenario performed on 6 June 1977 illustrates the use of the TermiNet with the computer inoperative to detect a fault by issuing an alarm summary command, and then to further isolate the cause to the fuse in the Power and Alarm module of the T1WB1 at Site Sibyl by examining maintenance voltages.

An example of multiple problem detection and isolation is illustrated by using data from the Appendix CC scenario conducted on 27 June 1977.

OPERATION UNDER DEGRADED CONDITIONS.
COMM. SYS: TIWBI FUSE AT SBL; DATEC: COMPUTER DOWN.

PROCEDURE	DATE	TIME
CC1. AT HUA PLACE THE COMPUTER IN THE SINGLE INSTRUCT MODE. THIS SIMULATES A COMPUTER FAILURE.		
CC2. AT SBL, REMOVE THE CONV FUSE ON THE POWER AND ALARM PANEL OF THE TIWBI. RECORD THE TIME.	6/6/77	0930
CC3. AT COMPLETION OF THE TEST REPLACE FUSE IN TIWBI EQUIPMENT.		1015

CONDUCTED BY T.J. Campbell 6/6/77

OBSERVED BY ____________

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Systems clea r ATT....////RR		6/6	0924
Computer failed att			1015
ADU indisctes a fault with the T1WB1, either here or a t SBL.. Have patched the TN into the MAC, and attempting to isolate the problem..///RR	7/6 June 77		1020
TN printouts indiaa te a fault with the pwr supply on the T1WB1 at SBL, for the +15 and +12 Vdc supply.. indica tions are that there is no problem at HUA....Have notified maint. at SBL to chk their T1WB1...////RR	8/6 June 77		1125
Problem isolated to faulty fuse on the T1WB1 at SBL.. Maintenance replaced same, and all systems clea r...//////RR			1135
Computor back in service ATT...///RR			1147

TECH CONTROLLER ________

OBSERVED BY ________

#7

6 June 27

1D118\GX

1D1/18\G

Ø018 +Ø7.79V \

1D1/19\G

ØØ19 +Ø6.22V \

3D118

3D1/18/23\G

```
ØØ18 +ØØ.Ø32V
ØØ19 +ØØ.Ø32V
ØØ2Ø +Ø4.96V
ØØ21 -Ø6.Ø6V
ØØ22 +Ø8.Ø4V
ØØ23 -Ø6.71V \z
```

1125

#8
6 June 27

2M\G

11\[

2A1\G

00'' '00000 0000000000 0000000000 0000000000 0000000000\%

2A2\G

0001000000 0000000000 0000000000 0000000000 0000000000\%

1D1/04\G#

3D1/18\G

0018 +00.032V \0

3D1/19\G

0019 +00.032V \1

3D1/20\G

0020 +04.96V \

OPERATION UNDER DEGRADED CONDITIONS

PROCEDURE	DATE	TIME
CC1. AT HUA, PLACE COMPUTER IN SINGLE INSTRUCT MODE.	6/27	0845
CC2. AT HUA, CLOSE HUA RX A WAVEGUIDE SHUTTER.		0846
CC5. AT COMPLETION OF TEST OPEN WAVEGUIDE SHUTTER AND RESTART COMPUTER.		0942
CC3 PULL FUSE CY-104 ON TIMS1 @ HUA		0859
CC4. PLACE LOOP SWITCH ON @ HUA		0905

CONDUCTED BY D. Thomas Doyle

OBSERVED BY ______________

DATEC SYSTEM EVALUATION WORKSHEET 27 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Sta rting new day with systems green...////RR		6/27	0745
Maint advs the computor has crumped..will have to use the terminaet for trble shooting..///RR			0842
Notice parameter alarm HUA alarm summary, did not see the problem on the Major alarm summary, asked m maint to switch to "B" radio because MAC maint voltage was low./cs			o850
Maint advise "A" radio is good,...		6/27	0854
Mac voltage X still indicates XXXXXX on "A" radio the RSLs are down, "B" are OK./cs ...SBL's RSLs are good for both radios./cs		6/27	0859
All other parameters look good for the other radios except for "A" Rx eye margin,,.conclude single path problem./cs			0910
T1WB1 here and SBL has an alarm,CY104 alarm at HUA RADio "A" problem... request loopback in house at SBL ans and HUA,maint advise SBL OK and HUA T1WB1 loopback still gave framing errors..maint replced fuse in tiWB1 at HUA../cs (it was blown)/cs			0918
A 11 alarms at SBL gone, request loopback on CY104 inhouse atHUA,/cs			0923
Maint advise that CY104 at HUA had a blown fuse it was replaced,is back on line.,/:cs XXXXXX			0924
CY104 problem cleared,XX the only problem left is still the "A" Rx radio at HUA . /cs			0929
Maint advise there was an obstruction in front of the "A" radio Antenna.it was removed, RSLs came back to normal.. radio switched back to "A", All green again./cs			0939
Computor is back up./cs			0941

Y

Problems;
1) bad fuse in T1Wb1 and CY104 at HUA
2) path obstruction
3) computor failure

Suggestion: Make sure the TC has a list of the of the voltages and tables associated therewith readily available resulting in positive cogniscence.

TECH CONTROLLER [signature]

OBSERVED BY cms

6.1.18 The Capability of DATEC to Recover from a Power Loss

Although a test procedure was written (Appendix I) to demonstrate DATEC's capability to recover from a power loss, this test was not intentionally performed during field tests at Ft. Huachuca. Recovery from power loss was demonstrated several times during in-plant checkout tests of DATEC. Although unplanned, this capability was utilized at least on one occasion while at Ft. Huachuca during storm activity. This is recorded in the software log by an entry on 19 July 1977 (see page 463). As the entry notes, the DATEC system recovered in an orderly manner and normal scanning was resumed.

TEST NO.________
DEV. NO.________
DATE______ PAGE_____ OF_____

POWER FAILURE DUE TO STORM AT 1442 HRS, 19 JUL 77
CRT WENT BLANK, COMPUTER WENT INTO POWER-FAIL
RECOVERY ROUTINE - BACK ON THE AIR AT 1443 HRS
WITH SCREEN BEING PAINTED AND SCAN CONTINUING
AT POINT OF INTERRUPT. POWER-FAIL ROUTINE
WORKS FINE.

20 JULY 77 - WEDNESDAY

START-UP PROCEDURE DID NOT SHOW THE PROMPT CHARACTER
ON THE ADDS CRT. COMPUTOR WAS LOOPING ABOUT 14554.
THE ADDS WAS NOT RECEIVING FROM THE COMPUTER.
THE EIA/CL CONNECTOR ON BACK-SIDE OF ADDS WAS LOOSE.
TIGHTENED CONNECTOR ... BACK TO NORMAL ...

21 JULY 77 - THURSDAY

PH, TN $SMST3 4.25.3 ALREADY DOCUMENTED ON HIPO
AND PLAYSCRIPT.

```
21474  LDA 21625  →  JMP 21727
21727  CRA
21730  STA 21743      CHEX
21731  LDA 21635
21732  JMP 21475

21537  LDA* 21636  →  JMP 21733
21733  LDA* 21636
21734  STA 21743      CHEX = NON-ZERO
21735  JMP 21540
21617  CRA   →   JMP 21736
21736  LDA 21743   CHEX
21737  SNZ
21740  JMP 21621   (RTMX)
21741  CRA
21742  JMP* 21456
21743  0            BSZ FOR CHEX
```

PATCH TO INSURE THAT THE BEM SELF TEST VOLTAGE TOLERANCES ARE CHECKED

6.1.19 The Ability of Nodal Site to Obtain Information on Parameters/Alarms Monitored at the Remote Site

This aspect of DATEC's capabilities was repeatedly demonstrated throughout all phases of the field tests. This is indicated in the test data for the validation portion of field tests as will be noted in Section II of the Field Test and Evaluation Report. Also, the capability of DATEC to provide information at the nodal site regarding the remote site even though in a degraded condition was addressed in paragraph 6.1.17 of this section.

The usefulness of this capability is most apparent in data taken from the System Simulation Scenarios. Two examples, Appendix N (7 June) and Appendix BB (21 June), follow. A third example, Appendix O (2 June) may be found on pages 236 through 241. The tech controllers' own remarks indicate this most clearly. Note in the Appendix BB scenario that although pulling the fuse from the T1-4000A unit at Ft. Huachuca results in alarms at both Ft. Huachuca and Site Sibyl, the fault was correctly isolated through the use of additional information from the remote site; i.e., T1-4000 maintenance voltages.

PROCEDURE	DATE	TIME
Reciprocal Path Problem		
N1. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at both HUA and SBL.		
Transmit Antenna Only at Sibyl		
N2. Insert 10dB of attenuation between equalizer and IF in the A and B receivers at HUA and the B receiver only at SBL. (Accomplished by inserting 10dB of attenuation in transmit waveguide @ SBL)	6-7-77	0843
N3. Restore equipment to baseline configuration	6-7-77	0906

CONDUCTED BY C L Christus 6-7-77

OBSERVED BY ____________

7 June 77 Pg # 1

DATEC SYSTEM EVALUATION WORKSHEET

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Start new day with all systems clear, and system data attached..////RR	1-4/7 June 77	6/7	0840
CRT display shows Amber on both "A" & "B" radio here at HUA...Also showing RED FLAG on the RSL margin here at HUA...////RR	5/7 June 77		0848
Displays now showing Amber for "B" radio at SBL also...LP display indicates RSL margin for both "A" & "B" radios at HUA, and for "B" radio at SBL have dropped drastically...////RR	6-7/7 June 77		0900
Have requested SBL maintenance check his antenna alignment, as indications are that this is cause of degrading RSL margins...////RR			0905
Problem isolated/solved..SBL maintnenace re-aligned his antenna set-up....////RR	8/7 June 77		0911

TECH CONTROLLER ____

OBSERVED BY ____

```
                                           SYSTEM OVERVIEW                 TIME 15[illegible]:14
                 HUA          SBL
R  IO A           .            .
      B           .            .             #1
MUX SW            .            .             7 june 77
      A           .            .
      B           .            .
CY104             .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
                  .            .
T1WB1             .            .
                  .            .
                  .            .
                  .            .
              ......................
TELEMETRY.          .           .
         .          .           .
SITE     .          .           .
```

```
AS-1                             LINK STATUS                          TIME 153/[illegible]:45
                          ......T1-4000......                         ......RADIO......
                             HUA          SBL                           HUA        SBL
  ALARM       SW MAJOR                .                  TX PROB                .
              SW MINOR                .                  RX PROB                .
              MAJOR                   .                                         .
  STATUS      TX IN SVC      A        .        A         TX IN SVC       A      .      A
              RX IN SVC      A        .        A         RX IN SVC       A      .      A
              MAINT                   .                  MAINT                  .
  PARAMETER   FER         <1.0E-7     .<1.0E-7           RX SQUELCH             .
              CRFRM                   .                  RSL MARGIN   29.103    . 37.7[illegible]
                                                         EYE MARGIN   14.39[illegible]   . 13.432
              BER COR     NO DATA     .NO DATA           EYE AMPL    -3.8065    .-3.9677
                                                         EYE HITS        0.[illegible]  .    3.[illegible]
                                                         DER BER     4.3E-14    . 1.4E-13
                                                                             PAGE 1
```

2 7 June 77

IO-005 LINK STATUS TIME 153/[illegible]

......CY-104...... ......[illegible]......

		HUA	SBL		HUA	SBL
ALARM	SERVICE	.		OFFICE	.	
		.			.	
	REMOTE	.			.	
		.			.	
		.			.	
STATUS	MAINT	.		MAINT	.	
		.			.	
		.			.	
PARAMETER	CHANNEL	.		FER <1.0E-6	.<1.0E-6	
		.		REFRAME	.	
		.				
SITE ALARMS	ENTRY	.				
	FIRE	.				
	AC PWR	.				
	BATTERY	.				
	W.A. PR	.				
	W.G. HV	.				
	FLOOD	.				

PAGE 2

MAC-1-01-06 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 153/[illegible]

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	29.103	29.519	29.525	.71764	29.694	.23740	--------	--------	DB
A	EYEMAR	14.300	14.300	9.5761	.49295	11.235	2.5725	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.02489	.05565	.04772	.04809	--------	--------	/SC
HUA	RSLMAR	32.018	33.156	33.821	1.5368	29.132	.63211	--------	--------	DB
B	EYEMAR	12.459	12.459	6.3744	1.7527	4.3615	2.2521	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.98273	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9968	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.56056	1.1174	5.8953	5.6949	--------	--------	/SC
SBL	RSLMAR	37.700	38.200	37.200	.49161	39.860	.67219	--------	--------	DB
A	EYEMAR	13.482	13.482	13.039	.40993	12.443	.49446	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9935	--------	--------	--------	RATE
	EYEHIT	0.0	.00931	12.136	24.273	1.6931	2.3895	--------	--------	/SC
SBL	RSLMAR	31.400	32.958	34.331	.36134	35.278	.55534	--------	--------	[illegible]
[illegible]	EYEMAR	13.043	13.453	13.409	.32655	11.525	1.0311	--------	--------	[illegible]
	RSLAVL	[illegible]	[illegible]	[illegible]	--------	[illegible]	--------	--------	--------	[illegible]
	EYEAVL	[illegible]	[illegible]	[illegible]	--------	[illegible].9935	--------	--------	--------	[illegible]
	EYEHIT	[illegible]	[illegible]	.[illegible]29	.[illegible]	2.3144	3.9897	--------	--------	[illegible]
LII		1.0000	1.0000	1.0000	--------	[illegible].9968	--------	--------	--------	

#3 7 June 77

IQ-ØØ6 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 158/Ø332:54

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	EYEVOL	-3.68ØØ	-3.68ØØ	-4.Ø947	.45251	-3.9563	.23783	--------	--------	VLTS
A	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	1.ØØØØ	--------	--------	--------	RTE
HUA	EYEVOL	-3.84ØØ	-3.84ØØ	-4.3712	.18345	-4.5289	.22754	--------	--------	VLTS
B	RXSQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	11.ØØØØ	--------	--------	--------	RTE
HUA	LNKAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9984	--------	--------	--------	RTE
SBL	EYEVOL	-3.75ØØ	-3.75ØØ	-3.7892	.Ø359Ø	-3.8451	.Ø4378	--------	--------	VLTS
A	RXSQH	Ø.Ø	Ø.Ø	2.ØØØØ	--------	9.ØØØØ	--------	--------	--------	RTE
SBL	EYEVOL	-3.71ØØ	-3.735Ø	-3.7569	.Ø284Ø	-3.9271	.14494	--------	--------	VLTS
B	RXSQH	Ø.Ø	Ø.Ø	2.ØØØØ	--------	4.ØØØØ	--------	--------	--------	RTE
SBL	LNKAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE

M -1-Ø7-12 LINK PERFORMANCE ASSESSMENT - T1-4ØØØ TIME 158/Ø333:38

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	FER	1.ØE-15	1.3E-16	2.4E-1Ø	--------	1.7E-1Ø	--------	--------	--------	RTE
A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	Ø.Ø	2.ØØØØ	--------	1.3333	.94281	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	Ø.Ø	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	Ø.Ø	--------	--------	--------	RTE
HUA	FER	1.ØE-15	6.7E-17	1.4E-13	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	--------	--------	--------	--------	RTE
	CRFRM	Ø.Ø	Ø.Ø	2.ØØØØ	--------	4.ØØØØ	3.266Ø	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	Ø.Ø	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	Ø.Ø	--------	--------	--------	RTE
SBL	FER	8.8E-8	1.2E-8	4.ØE-6	--------	7.2E-1Ø	--------	--------	--------	RTE
A	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RTE
	CRFRM	Ø.Ø	Ø.Ø	3.ØØØØ	--------	2.3333	2.6247	--------	--------	RTE
	CR/SQH	Ø.Ø	Ø.Ø	Ø.Ø	--------	4.ØØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	5.ØØØØ	--------	--------	--------	RTE
SBL	FER	5.2E-1Ø	1.7E-11	3.9E-6	--------	--------	--------	--------	--------	RTE
B	FERAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	--------	--------	--------	--------	RTE
	CRFRM	Ø.Ø	Ø.Ø	2.ØØØØ	--------	1.6667	1.6997	--------	--------	RTE
	CR/SOH	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.ØØØØ	--------	--------	--------	RTE
	CR/HIT	Ø.Ø	Ø.Ø	Ø.Ø	--------	3.ØØØØ	--------	--------	--------	RTE

#4 7 June 77

AS-1 LINK PERFORMANCE ASSESSMENT - T1W31 TIME 158/Ø334:38

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	DEV	LAST 30 DAYS MEAN	DEV	LAST 30 MTHS MEAN	DEV	
HUA	FER	1.2E-14	4.ØE-16	1.6E-15	--------	3.5E-1Ø	----------	----------	----------	RTE
	RFRM	Ø.Ø	Ø.Ø	3.ØØØØ	--------	7.ØØØØ	5.ØØ9Ø	----------	----------	RTE
SBL	FER	1.2E-14	7.2E-8	9.5E-5	--------	1.2E-9	----------	----------	----------	RTE
	RFRM	Ø.Ø	2.ØØØØ	6.ØØØØ	--------	2.ØØØØ	2.16Ø2	----------	----------	RTE

IQ-ØØ7 MAINTENANCE VOLTAGES - HUA TIME 158/Ø335:29

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.6	G	16.5	15.7	15.Ø	14.2	13.5	15.5	.Ø23	153/ØØØ7
Ø2	T1WB1+12	12.4	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.4	.Ø1Ø	153/ØØØ7
Ø3	T14ØØØ+5	4.96	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.94	.ØØ4	153/ØØØ7
Ø4	T14ØØØ-6	-6.Ø8	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø8	Ø	153/ØØØ7
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	23.9	.Ø14	153/ØØØ7
Ø6	RADIO-2Ø	-19.9	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-19.9	.ØØ3	153/ØØØ7

MAC-1-13-17 MAINTENANCE VOLTAGES - SBL TIME 158/Ø336:15

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.1	.Ø21	153/ØØ11
Ø2	T1WB1+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	.ØØ5	153/ØØ11
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/ØØ11
Ø4	T14ØØØ-6	-6.Ø4	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	.ØØ3	153/ØØ11
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.Ø11	153/ØØ11
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	Ø	153/ØØ11

#5 7 June 77

```
IQ-005                                   SYSTEM OVERVIEW                  TIME  15[illegible]
                 HUA       SBL
RADIO A          .AI<       .
      B          .AS<       .
MUX SW            .         .
     A            .         .
     B            .         .
CY104             .         .
                  .         .
                  .         .
                  .         .
                  .         .
                  .         .
                  .         .
                  .         .
                  .         .
TIWB1             .         .
                  .         .
                  .         .
             .....................
TELEMETRY.        .         .
SITE     .        .         .
```

```
MAS                                       LINK STATUS                          TIME  15[illegible]:16
                                     .......T1-4000.......                     .......RADIO.......
                                     HUA           SBL                           HUA        SBL
  ALARM        SW MAJOR                     .                 TX PROB                .
               SW MINOR                     .                 RX PROB                .
               MAJOR                        .                                        .
  STATUS       TX IN SVC              A     .     A           TX IN SVC      A       .    A
               RX IN SVC              A     .     A           RX IN SVC      A       .    A
               MAINT                        .                 MAINT                  .
  PARAMETER    FER              <1.0E-7     .<1.0E-7          RX SQUELCH             .
               CRFRM                        .                 RSL MARGIN     18.113 R. 37.[illegible]
                                                              EYE MARGIN     13.369  . 13.369
               BER COR          NO DATA     .NO DATA          EYE AMPL      -8.8065  .-8.[illegible]
                                                              EYE HITS          0.0  .    [illegible]
                                                              DER BER      1.6E-13   . 1.[illegible]-13
                                                                                  PAGE 1
```

#6 7 June 77

AS-2 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 15[illegible]

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3[illegible] DAYS MEAN	LAST 3[illegible] DAYS DEV	LAST 3[illegible] MEAN	LAST 3[illegible] DEV	
HUA	RSLMAR	18.113	26.140	29.524	.67129	29.694	.23740	--------	--------	DB
A	EYEMAR	13.369	13.600	10.251	1.7150	11.235	2.6725	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.02133	.05226	.04772	.04809	--------	--------	/SC
HUA	RSLMAR	23.040	30.330	33.733	1.4543	29.132	.68211	--------	--------	DB
B	EYEMAR	11.562	11.784	7.3052	2.6253	4.3615	2.2521	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.98273	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9968	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.46713	1.0412	5.3953	5.6949	--------	--------	/SC
SBL	RSLMAR	37.500	37.233	37.366	.58344	39.860	.67219	--------	--------	DB
A	EYEMAR	13.369	14.329	13.113	.40907	12.443	.49446	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9935	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	10.115	22.614	1.6931	2.3895	--------	--------	/SC
SBL	RSLMAR	33.545	33.639	34.077	.75517	35.278	.60504	--------	--------	DB
B	EYEMAR	13.597	13.597	13.450	.31228	11.595	1.6311	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9936	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00024	.00054	2.8104	3.9697	--------	--------	/SC
V11	1.0000	1.0000	1.0000	--------	0.9936	--------	--------	V11	0.0	

#7 7 June 77

```
            HUA        SBL
RADIO A     .AI<        .
      B     .AS<      >SA.
MUX SW        .         .
      A       .         .
      B       .         .
CY104         .         .
              .         .
              .         .
              .         .
              .         .
              .         .
              .         .
              .         .
              .         .
TIWBI         .         .
              .         .
              .         .
              .         .
           ......................
TELEMETRY.        .         .
SITE     .        .         .
```

LINK PERFORMANCE ASSESSMENT - RADIOS TIME 153/0900:09

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 30 DAYS MEAN	LAST 30 DAYS DEV	LAST 30 MTHS MEAN	LAST 30 MTHS DEV	
HUA	RSLMAR	17.593	24.438	29.524	.67129	29.694	.23740	--------	--------	DB
A	EYEMAR	12.459	13.220	10.251	1.7150	11.235	2.6725	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.02133	.05226	.04772	.04809	--------	--------	/SC
HUA	RSLMAR	23.577	28.980	33.738	1.4543	29.132	.68211	--------	--------	DB
B	EYEMAR	11.562	11.784	7.8052	2.6253	4.8615	2.2521	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	.98273	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9968	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.46713	1.0412	5.8953	5.6949	--------	--------	/SC
SBL	RSLMAR	40.444	38.036	37.366	.58344	39.860	.67219	--------	--------	DB
A	EYEMAR	13.369	14.329	13.113	.40907	12.443	.49446	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9935	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	10.115	22.614	1.6931	2.3895	--------	--------	/SC
SBL	RSLMAR	23.818	31.184	34.077	.75517	35.278	.60504	--------	--------	DB
B	EYEMAR	12.914	13.256	13.450	.31228	11.595	1.6311	--------	--------	DB
	RSLAVL	1.0000	1.0000	1.0000	--------	1.0000	--------	--------	--------	RATE
	EYEAVL	1.0000	1.0000	1.0000	--------	0.9936	--------	--------	--------	RATE
	EYEHIT	0.0	0.0	.00024	.00054	2.3104	3.9697	--------	--------	/SC
R		0.0	0.0	10.115	22.614	1.6931	2.3895	--------	--------SJ1S LS11	23.

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3 DAYS MEAN	LAST 3 DAYS DEV	LAST 3 [illegible] MEAN	LAST 3 [illegible] DEV	
HUA	RSLMAR	23.413	24.2Ø3	29.524	.67129	29.694	.2374Ø	--------	--------	DB
A	EYEMAR	12.459	13.22Ø	1Ø.251	1.715Ø	11.235	2.6725	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø2133	.Ø5226	.Ø4772	.Ø48Ø9	--------	--------	/SC
HUA	RSLMAR	32.632	28.563	33.738	1.4543	29.132	.68211	--------	--------	DB
B	EYEMAR	11.341	11.636	7.8Ø52	2.6253	4.8615	2.2521	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	.98273	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9968	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.46713	1.Ø412	5.8953	5.6949	--------	--------	/SC
SBL	RSLMAR	4Ø.222	38.473	37.366	.58344	39.86Ø	.67219	--------	--------	DB
A	EYEMAR	13.369	14.329	13.113	.4Ø9Ø7	12.443	.49446	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9935	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	1Ø.115	22.614	1.6931	2.3395	--------	--------	/SC
SBL	RSLMAR	33.182	31.584	34.Ø77	.75517	35.278	.605Ø4	--------	--------	DB
B	EYEMAR	13.142	13.218	13.45Ø	.31228	11.595	1.6311	--------	--------	DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	--------	--------	--------	RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9936	--------	--------	--------	RATE
	EYEHIT	Ø.Ø	Ø.Ø	.ØØØ24	.ØØØ54	2.81Ø4	3.9697	--------	--------	/SC

#8 7 June 77

IQ-ØØ6 SYSTEM OVERVIEW TIME 153/Ø911:Ø8

	HUA	SBL
RADIO A	.	.
B	.	.
MUX SW	.	.
A	.	.
B	.	.
CY1Ø4	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
TIWBI	.	.
	.	.
	.	.

....

T. EMETRY. . . .

SITE . . .

HIGH LEVEL MUX FAILURE - POWER SUPPLY (SBL)

PROCEDURE	DATE	TIME
BB1. At SBL, remove the LINE fuse from the Power and Alarm module of the NORMAL TI-4000. Record the time.	6-21-77	0906
BB2. At completion of the test, replace fuse in TI-4000 equipment.	6-21-77	0913

CONDUCTED BY C. L. Christner 6-21-77

OBSERVED BY ____________________

DATEC SYSTEM EVALUATION WORKSHEET 21 June 77, Pg # 1

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
Starting new day, with systems green..////RR		6/21	0900
Over shows major alarm for T1-4000 switch, here and at SBL.....Also showing "A" mux red..//RR	1/21 June 77		0906
Alarms at HUA cleared...Still showing alarms on the "A" mux at SBL......///RR			0908
System up on "B" mux at SBL...MV display indicates that SBL haveing problem with pwr supply on his "A " mux....Requested maint at SBL check this..///RR	2/21 June 77		0910
S ystems again green, back on the "A" sys tems.. Ma int at SBL replaced blown fuse...///			0914
System now showing amber on in-service mux's both here at SBL...Awaiting an update on the CRT..//RR			0916
CRT now shoing Green on all mux's....The parameter alarm apparently caused by switching back to the "A" mux at SBL...////RR			0926

Problem isolated to a blown fuse in the "A" mux (T1-4000) at SBL....///RR

Displays deemed useful

1. System overview (to initally identify problem...

2. MI ta ble for MV at SBL (to identify exactly what was wrong with the mux at SBL)...///RR

TECH CONTROLLER cms

OBSERVED BY R

#1
21 June 77

```
AS-2                                  SYSTEM OVERVIEW                  TIME  172/[illegible]6:36
                 HUA        SBL                          MAJOR ALARM
RADIO A           .          .
      B           .          .
MUX SW            .R<>    <>R.
     A            .R<>    <>R.
     B            .          .
CY104             .          .
                  .          .
                  .          .
                  .          .
                  .          .
                  .          .
                  .          .
                  .          .
TIWBI             .R41<>     .
                  .          .
                  .          .
           .......................
TELEMETRY.           .          .
         :           :          :
SITE     .           .          .
```

```
MAS                                   SYSTEM OVERVIEW                  TIME  172/[illegible]:5[illegible]
                 HUA        SBL
RADIO A           .          .
      B           .          .
MUX SW            .       <>R.
     A            .       <>R.
     B            .          .
CY104             .          .
                  .          .
                  .          .
                  .          .
                  .          .
                  .          .
                  .          .
T1                .          .
                  .          .
                  .          .
           .......................
TELEMETRY.           .          .
         :           :          :
SITE     .           .          .
```

#2

21 June 77

MAC-3-Ø1-Ø6 LINK STATUS TIME 172/Ø9 [illegible]8:46

		......T1-4ØØØ......			......RADIO......	
		HUA	SBL		HUA	SBL
ALARM	SW MAJOR		.	TX PROB	.	
	SW MINOR		. *	RX PROB	.	
	MAJOR		. A		.	
STATUS	TX IN SVC	A	. B	TX IN SVC	A .	A
	RX IN SVC	A	. B	RX IN SVC	A .	A
	MAINT		.	MAINT	.	
PARAMETER	FER	<1.ØE-7	.<1.ØE-7	RX SQUELCH	.	
	CRFRM		.	RSL MARGIN	31.27[illegible]	. 38.[illegible]
				EYE MARGIN	[illegible].663[illegible]	. 12.[illegible]
	BER COR	NO DATA	.NO DATA	EYE AMPL	-[illegible].2677	.-8.[illegible]
				EYE HITS	[illegible].[illegible]	. [illegible].[illegible]
				DLR BER	5.[illegible]E-11	. 3.[illegible]E-13

PAGE 1

MAC-3-18-23 MAINTENANCE VOLTAGES - SBL TIME 172/ØØ1[illegible]:32

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.1	.[illegible]	153/[illegible]11
Ø2	T1WB1+12	12.3	G	13.2	12.6	12.[illegible]	11.4	1Ø.8	12.3	.[illegible]Ø3	153/[illegible]11
Ø3	T14ØØØ+5	.324	R	5.5Ø	5.25	5.[illegible]	4.75	4.5Ø	4.95	.ØØ3	153/[illegible]11
Ø4	T14ØØØ-6	-.ØØ1	R	-5.44	-5.7Ø	-6.[illegible]	-6.33	-6.6Ø	-[illegible].[illegible]4	.ØØ4	153/[illegible]11
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.Ø56	153/[illegible]11
Ø6	RADIO-2Ø	-2Ø.1	G	-1[illegible].Ø	-19.Ø	-2[illegible].[illegible]	-21.[illegible]	-22.Ø	-2[illegible].1	.Ø12	153/[illegible]11

D24GD28 16.5 15.7 15.[illegible] 14.2 13.5 D58 15.1 .Ø1[illegible] 153/Ø211E[illegible] [illegible]

Ø33SYSTEM OVERVIEWØØRADIO A B15. .C[illegible] . .E[illegible]

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6.1.20 The Effects on DATEC Caused by Degradation or Total Outage of the Transmission Link Connecting the PATE with the Remote Site DATEC Equipments

The DATEC system has a built-in test routine which checks the validity of data being transmitted from the remote site. The purpose of this test is to reject (i.e., not use) data which may be incorrect and to alert the operator of the fact that questionable data is being received at the PATE. If for some reason the transmission link degrades to the point that the command sent by the PATE to a remote site is not "echoed back" correctly, the data requested is not processed and an error message such as "MAX RETRANS" or "NO RESPONSE" is generated as well as an alarm asterisk in the Telemetry Field on the System Overview display. See paragraph 6.1.2 of this section for further discussion of this feature.

During special tests which were performed to obtain bit error rate (BER) correlation data with DATEC connected first to the Collins AN/FRC-162 radio and then to the AVANTEK DR8A radio, it was noted that the telemetry link remained intact even though the received signal level had dropped to such a value as to cause error rates greater than 10^{-2}. At this point, reframes on the T1-4000 and T1WB1 were noted, but the built-in-test routine described in the preceding paragraph detected no telemetry transmission errors. Table 6-8 is a summary of results obtained when tests were conducted first on the 150 Baud telemetry link and then on the 75 Baud link.

An example of the effects of DATEC caused by degradation or total outage of the transmission link was obtained during performance of the System Test Scenario of Appendix T on 8 June 1977. In this test, damage to Site Sibyl equipment by an assumed lightning strike was simulated. Increasing degradation was simulated by adding attenuation in the transmit waveguide at Sibyl at the rate of 2 dB per minute. Note from the computer printout at 1509 hours that valid Maintenance Voltage data is being received from Site Sibyl one minute before the link went completely off the air as noted by squelches on both A and B receivers at Ft. Huachuca. Note also from the next printout made following the link (and therefore telemetry) outage which shows the error message "NO RESPONSE" as a result of the query for MAC voltages 1 through 6 at Sibyl (MAC-3-01-06). Finally, observe that the telemetry is in alarm ("R") condition in the printout made at 1519 and the Radio RX alarm (RI< opposite RADIO A and RS< opposite RADIO B) under HUA has been activated.

TABLE 6-8. TELEMETRY PERFORMANCE EVALUATION

Conditions: Reduce RSL, SBL to HUA (RX A)

Normal RSL, HUA to SBL

Receiver locked to RX A at HUA:

Squelch set to minimum

150 B/S Telemetry Evaluation:

Status (Telemetry from SBL)	RSL Margin (HUA)	System BER
OK	-5.28 dB	8.6×10^{-4}
OK	-6.8 dB	3.2×10^{-3}
OK	-8.dB	2.6×10^{-2}
OK	<-9.0 dB	Loss of Sync

75 B/S Telemetry Evaluation:

*SBL Alarm Scanner Operation	RSL Margin (HUA)
OK (No false alarms)	6.7 dB
OK (No false alarms)	0.17 dB
OK (No false alarms)	-6.2 dB
OK (No false alarms)	-9.0 dB

*T1WB1 alarm was activated to confirm proper operation

PROCEDURE	DATE	TIME
At SBL, with power off, before scenario begins, perform the following steps (refer to figure T-1 for special test equipment installation information): • Install the Frame Bit Error Generator (FBEG) in transmit baseband between the T1-4000 and radio. • Install attenuators (x 10) between equalizer and IF in both A and B receivers. Set attenuators to 0dB. • Change wiring of SITE ALARM switch at MAINTENANCE panel in SBL ARS rack from the DATEC Flood alarm monitor line to the Battery alarm monitor. (1) Move wire from AS TB2-19 to TB2-127; (2) Add jumper between TB2-106 & TB2-124.		
T1. At some time after scenario starts, interrupt or in some way turn off power to all equipment, communication and DATEC, at SBL; record time. Leave off for 10 seconds. While power is off, place SITE ALARM switch on MAINTENANCE panel in SBL ARS rack ON.	6-8-77	1436
T2. After 10 seconds have elapsed, turn all power at SBL back on; restore all communications equipment to normal operation, then insert 10 dB of attenuation in the receiver that is in service. Perform this step as quickly as possible.	6-8-77	1436
T3. For the next 15 to 20 minutes periodically depress the pushbutton switch on the FBEG with the selector switch set to NARROW. (The rate should be one occurrence every two to three minutes). Record the time each perturbation is introduced. Perturbation No. 1 " " 2 " " 3 " " 4 " " 5 " " 6 " " 7 " " 8		
T4. In a period of approximately 4 seconds, introduce in both receivers at SBL enough attenuation to drive both receivers below the switchover point;		1458

CONDUCTED BY C. L. Christney 6-8-77

OBSERVED BY ____________

PROCEDURE	DATE	TIME
then remove the attenuation just introduced. (The receiver not in service at the completion of this step should have 10dB of attenuation still inserted.		
T5. At SBL, introduce maximum attenuation using the attenuator installed in the transmitter wave-guide.	START LINK DOWN	1459 1510
T6. At completion of this scenario, restore all equipment to baseline configuration.		

CONDUCTED BY C L Christner 6-8-77

OBSERVED BY ____________

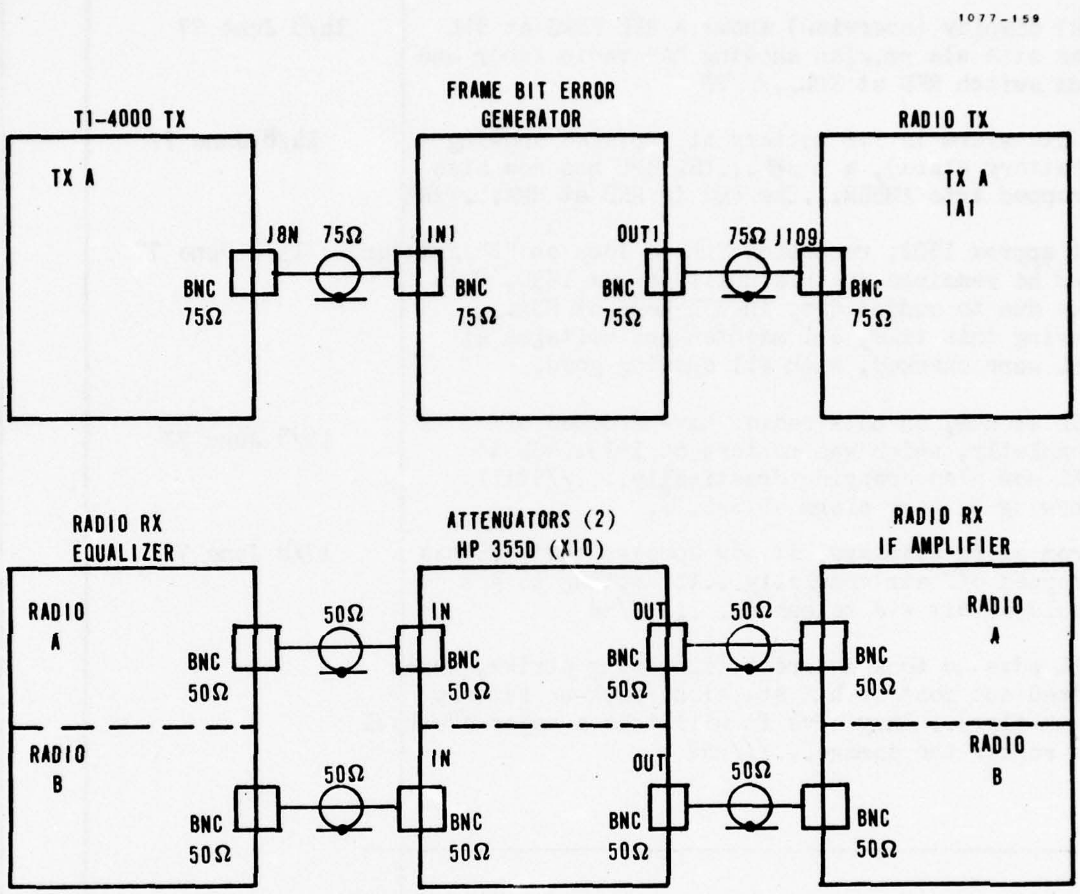

Figure T-1. Test Configuration,
Multiple Link Equipment Failures

DATEC SYSTEM EVALUATION WORKSHEET 8 June 77 Pg # 3

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
A 11 systems green att...////RR		6/8	1407
CRT display (overview) shows a RED FLAG at SBL for site ala rm,also showing "A" radio Amber and aux switch RED at SBL..///RR	14/8 June 77		1442
Site alarm is for battery at SBL(also showing battery alarm), a t SBL...RSL SBL has now also dropped into AMBER...The FER is RED at HUA...//RR	14/8 June 77		1445
At approx 1502, requested SBL to lock on "B" xmitter, and he remained on this until approx 1530. This was due to sudden drop in RSL here at HUA... During this time, all maintenance voltages at SBL were checked, with all showing good.	15/8 June 77		[illegible] 1504
RSL at HUA, on both radios have dropped off completly, which was noticed at 1515..RSL at SBL now also dropping drastically....//Still showing battery alarm at SBL....	16/8 June 77		1515
From alarm displays, it now appears that SBL has dropped off air completly...Attempting to get ahold of him via telephone......//RR	17/8 June 77		1519
SBL advs he took a direct lightening strike, which wiped out most of his sta tion (back-up battery bank also).. They advs it will take a major overhaul to repair the damage...///RRR			1525

TECH CONTROLLER R

OBSERVED BY CMS

```
MA-2                                  SYSTEM OVERVIEW                  TIME   159/1442:32
              HUA          SBL                            MAJOR ALARM
RADIO A        .          >IA.
      B        .             .
MUX SW         .          <>R.
     A         .             .
     B         .             .
CY1Ø4          .             .
               .             .
               .             .
               .             .
               .             .
               .             .
               .             .
               .             .
               .             .
T1WB1          .AØ1<         .
               .             .
               .             .
        .......................
TELEMETRY.             .          .
         .             .          .
SITE     .             .      R   .
```

14/8 June 79

```
IQ-ØØ6                                 LINK STATUS                     TIME   159/1444:Ø2
                                                             MAJOR ALARM
                               ......T1-4ØØØ......                ......RADIO......
                                 HUA          SBL                   HUA          SBL
   ALARM        SW MAJOR                 .               TX PROB            .
                SW MINOR                 .     *         RX PROB            .
                MAJOR                    .                                  .
   STATUS       TX IN SVC         A      .     B         TX IN SVC    A     .     A
                RX IN SVC         A      .     A         RX IN SVC    A     .     A
                MAINT                    .               MAINT              .
   PARAMETER    FER            3.7E-5 R.<1.ØE-7          RX SQUELCH         .
                CRFRM             *      .               RSL MARGIN  32.24Ø . 31.182 A
                                                         EYE MARGIN  12.459 . 15.29Ø
                BER COR        7.8326 R.NO DATA          EYE AMPL   -8.8Ø65 .-3.9677
                                                         EYE HITS       Ø.Ø .    Ø.Ø
                                                         DER BER    5.5E-13 . 1.ØE-15
                                                                        PAGE 1
```

```
MAC-1-Ø7-12              MAINTENANCE VOLTAGES - SBL            TIME  159/1454:1Ø
                                                                      INITIAL
NO.    NAME     VOLTS   C     RH    AH    CG    AL    RL    MEANMAC-1-Ø7-12
                                                                      INITIAL
N      NAME     VOLTS   C     RH    AH    CG    AL    RL    MEAN  DEV   DATE
Ø1  T1WB1+15     15.2   G    16.5  15.7  15.Ø  14.2  13.5  15.1  .ØØ9 153/Ø911
Ø2  T1WB1+12     12.3   G    13.2  12.6  12.Ø  11.4  1Ø.8  12.3     Ø 153/Ø911
Ø3  T14ØØØ+5     4.95   G    5.5Ø  5.25  5.ØØ  4.75  4.5Ø  4.95     Ø 153/Ø911
Ø4  T14ØØØ-6    -6.Ø4   G   -5.4Ø -5.7Ø -6.ØØ -6.3Ø -6.6Ø -6.Ø4  .ØØ2 153/Ø911
Ø5  RADIO+24     24.1   G    26.4  25.2  24.Ø  22.8  21.6  24.1  .ØØ9 153/Ø911
Ø6  RADIO-2Ø    -2Ø.1   G   -18.Ø -19.Ø -2Ø.Ø -21.Ø -22.Ø -2Ø.1  1.2E 153/Ø911
```

15 18 June 77

```
AS-2                          LINK STATUS                       TIME  159/1458:44
                          ......T1-4ØØØ......                   ......RADIO......
                             HUA       SBL                        HUA       SBL
  ALARM      SW MAJOR               .             TX PROB                .
             SW MINOR         *     .             RX PROB                .
             MAJOR                  .                                    .
  STATUS     TX IN SVC        B     .     A       TX IN SVC       A      .    A
             RX IN SVC        A     .     A       RX IN SVC       A      .    A
             MAINT                  .             MAINT                  .
  PARAMETER  FER          <1.ØE-7   .<1.ØE-7      RX SQUELCH             .
             CRFRM                  .             RSL MARGIN   28.873  . 28.583 A
                                                  EYE MARGIN   12.459  . 15.293
             BER COR      NO DATA   .NO DATA      EYE AMPL    -8.8Ø65  .-8.9677
                                                  EYE HITS     4.7787 R.    Ø.Ø
                                                  DER BER      5.5E-13 . 1.ØE-15
                                                                    PAGE 1
```

16/18 June 77

MA-2 MAINTENANCE VOLTAGES - SBL TIME 159/15Ø9:Ø6

NO.	NAME	VOLTS	C	RH	AH	CG	AL	MAJOR ALARM RL	MAJOR ALARM MEAN	DEV	INITIAL DATE
Ø1	T1WB1+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.1	.ØØ9	153/Ø911
Ø2	T1WB1+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	Ø	153/Ø911
Ø3	T14ØØØ+5	4.95	G	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø911
Ø4	T14ØØØ-6	-6.Ø4	G	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	.ØØ2	153/Ø911
Ø5	RADIO+24	24.Ø	G	26.4	25.2	24.Ø	22.8	21.6	24.1	.ØØ9	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	1.2E	153/Ø911

MAC-3-Ø1-Ø6 LINK PERFORMANCE ASSESSMENT - RADIOS TIME 159/1515:34

NO RESPONSE.

		LAST SCAN	LAST HR MEAN	LAST 24 HR MEAN	LAST 24 HR DEV	LAST 3Ø DAYS MEAN	LAST 3Ø DAYS DEV	MAJOR ALARM	LAST 3Ø MTHS MEAN	LAST 3Ø MTHS DEV	
HUA	RSLMAR	-2.Ø575	-2.Ø575	7.7ØØ3	12.642	25.Ø66	9.174Ø	----------------			DB
A	EYEMAR	-28.699	5.58Ø8	-.35421	4.5658	9.1217	4.2871	----------------			DB
	RSLAVL	Ø.Ø	Ø.Ø	.39113	--------	.84815	------------------------				RATE
	EYEAVL	Ø.Ø	.83333	.35338	--------	.85143	------------------------				RATE
	EYEHIT	364.Ø9	61.478	192.8Ø	94.11Ø	33.1Ø8	66.134	----------------			/SC
HUA	RSLMAR	-4.27Ø3	-4.27Ø3	32.3ØØ	2.1344	3Ø.682	2.Ø236	----------------			DB
B	EYEMAR	13.Ø28	8.5843	9.87Ø3	2.4385	6.5218	2.7858	----------------			DB
	RSLAVL	Ø.Ø	Ø.Ø	1.ØØØØ	--------	.937Ø1	------------------------				RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9978	------------------------				RATE
	EYEHIT	169.3Ø	42.325	Ø.Ø	Ø.Ø	4.15Ø7	4.9477	----------------			/SC
SBL	RSLMAR	26.182	35.Ø4Ø	38.767	1.Ø381	39.132	1.1168	----------------			DB
A	EYEMAR	15.29Ø	14.745	13.6Ø1	.31575	12.769	.56Ø43	----------------			DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	------------------------				RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9956	------------------------				RATE
	EYEHIT	Ø.Ø	Ø.Ø	.Ø1857	.Ø73Ø5	3.Ø423	4.Ø44Ø	----------------			/SC
SBL	RSLMAR	8.3571	31.Ø85	33.856	.77255	34.7Ø1	.86241	----------------			DB
B	EYEMAR	15.29Ø	14.551	13.649	.44282	12.334	1.554Ø	----------------			DB
	RSLAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	1.ØØØØ	------------------------				RATE
	EYEAVL	1.ØØØØ	1.ØØØØ	1.ØØØØ	--------	Ø.9957	------------------------				RATE
	EYEHIT	Ø.Ø	.Ø288Ø	Ø.Ø	Ø.Ø	1.6863	3.3693	----------------			/SC

```
MA-2                                 SYSTEM OVERVIEW                 TIME  159/1519:31
                HUA         SBL                          MAJOR ALARM
RA   0 A      .RI<      >IA.
       B      .RS<      >SA.
MUX SW        .R<>         .
     A        .R<>         .
     B        .R<>         .
CY104         .            .
              .            .
              .            .
              .            .
              .            .
              .            .
              .            .
T1WB1         .R01<>       .
              .            .
              .            .
         ......................
TELEMETRY.      R     .    R   .
         .            .        .
SITE     .            .    R   .
```

17/8 June 77

```
IQ-005                                LINK STATUS                    TIME  159/1521:26
                                  ......T1-4000......                 ......RADIO......
                                     HUA          SBL                   HUA       SBL
   ALARM        SW MAJOR              *      .              TX PROB           .
                SW MINOR              *      .              RX PROB      AB   .
                MAJOR                AB      .                                .
   STATUS       TX IN SVC             B      .      A       TX IN SVC    A    .     B
                RX IN SVC             A      .      A       RX IN SVC    A    .     A
                MAINT                        .              MAINT             .
   PARAMETER    FER              <1.0E-7     .<1.0E-7       RX SQUELCH        .
                CRFRM                 *      .              RSL MARGIN  -2.0575 R. 26.182 A
                                                            EYE MARGIN  -28.699 R. 15.290
                BER COR          NO DATA     .NO DATA       EYE AMPL    -8.0323 A.-8.9677
                                                            EYE HITS     364.09 R.    0.0
                                                            DER BER      .0100  R. 1.0E-15
                                                                              PAGE 1
```

6.1.21 <u>The Man-Machine Interface and if the Interface Can Be Easily Accomplished in the Operational Environment, and If It Is Presented In a Format that Is Useful to Operational Personnel</u>

The ease with which the System Simulation Scenarios test phase was started and the manner in which the scenarios were conducted throughout this phase of field tests present solid evidence of a compatible man-machine interface. The three tech controllers who originally started the scenarios received about one day of training from Honeywell personnel and then were allowed about one day of "hands-on" familiarization by themselves using a notebook of Honeywell prepared procedures. From that point on they were essentially on their own and received minimal help from Honeywell personnel - none while a particular scenario was in progress. After the scenario test phase had started, two additional tech controllers joined the group. These two received only an hour or two of indoctrination from Honeywell; the rest of their training was on-the-job, working with the more experienced tech controllers.

As the tech controllers gained experience they began to use more than just the conventional displays (i.e., System Overview, Link Status, Link Performance Assessment and Maintenance Voltages) in the normal scan mode to isolate and verify problem areas. They were becoming proficient in the use of the Monitor Immediate scan mode; in use of the CY-104 VF IQCS scan/display and in calling up parameter statistics tables to check past performance. The 29 June 1977 scenario data from Appendix EE illustrates the use of a number of different displays in a multiple failure scenario in which eight separate problems were found (refer to pages 417 through 427). The ease and speed with which various displays were interpreted is apparent. All the faults were traced in approximately 80 minutes.

Appendix R scenario, performed on 13 June 1977, involved introduction of an interfering frequency at the in-service receiver waveguide at Ft. Huachuca - a difficult problem to trace. Printouts from this scenario shown on pages 283 through 290 illustrate use of the Monitor Immediate mode and parameter tables to pinpoint the cause by studying its effects.

Although the tech controllers learned quickly to use the various tools that are available and put them to efficient use in solving problems as the above two scenarios illustrate, they still had suggestions for improvements to format:

1. FER data for the standby T1-400 should be available as well as the in-service unit on the Link Status display. The reason for this was to be able to assess the status of the standby unit before switching it on-line. This information was not added to the Link Status display as that would have meant a significant software change.

It was added, however, to the Monitor Immediate mode. Update time is still dependent on the sample time base of the EPUT. A special, shorter, time base for use in the Monitor Immediate mode was discussed in paragraph 6.1.5.

2. Another improvement that was suggested involved identifying on the Link Status and Link Performance Assessment displays the radio being monitored relative to Eye data. Only the A or B radio at a given site is monitored each scan. Each radio is therefore monitored once every other scan; or in this case once every seven to eight minutes. The Monitor Immediate mode takes care of this deficiency to some extent. If eye parameters are being examined to the extent that this rate of update becomes a significant factor, then the nodal controller is most likely in a maintenance or troubleshooting mode. The tech controller then has the option of going to the Monitor Immediate mode wherein the update rate of Eye parameters is limited only by the BEM. This amounts to a few seconds for Eye Margin, Eye Amplitude, Derived BER and Eye Voltage (dispersion voltage) and 90 seconds for Eye Hits. The feasibility of shortening the sample time for Eye Hits while in the Monitor Immediate mode was also discussed in paragraph 6.1.5.

3. Probably the most significant changes suggested were in the System Overview and Link Status displays. This was previously mentioned in paragraph 6.1.9.6. The display formats that the tech controllers recommended are shown there.

6.1.22 <u>The Ability to Use DATEC Without the Support of On-Site Computer Software Personnel</u>

The two Air Force tech controllers and Army personnel who were to evaluate the DATEC system were given a one day lecture and another day of hands-on experience to become familiar with the equipment and operator interaction commands. They were given a handout showing how to use all operator commands. Honeywell software personnel were available during this training period to answer questions and demonstrate the use of commands when requested. All personnel involved picked up the ability to operate the system within two to three hours of training. This included system start up, accessing and changing the data base, and bringing up the system displays.

During the running of the system scenarios, software personnel were not in the presence of the tech controllers. The system was run entirely by the tech controllers. After the first two weeks, they conducted operations from another building containing only the ADDS and TermiNet equipments. The software personnel assisted in running the scenarios from the equipment building and were available in case of system failure. Software and hardware personnel could monitor the tech controllers progress through a second ADDS terminal located in the equipment

building. There were only two instances during the month of evaluation in which Honeywell offered assistance to the tech controllers:

1. Appendix BB, 2 June 1977 - High Level MUX Failure, Power Supply - SBL. It was observed during the running of this test that the tech controllers were bringing up displays before the data displayed could be updated as a result of the perturbation. This is illustrated on Page 2 of this test, dated 2 June 1977. The controllers assumed that the maintenance voltages were good because they had not been updated yet. It takes approximately four minutes to update these voltages after starting the scan. At the completion of this test the controllers were given a detailed description of the relationship between the scanning process and the parameter value updates. This cleared up the misunderstanding.

2. Use of Overview Display. This instance is closely related to (1) above. It was observed early in the scenario processing that the controllers were rapidly jumping from one display to another in an attempt to find the problem. By doing this, they were interrupting the scan and therefore no parameters were being updated. The reason that this was being done was that, having been forewarned that a problem existed, they instantly went into a maintenance or fault isolation mode. This is not the intent of the nodal control concept. A meeting was held on 16 June 1977 in which it was suggested that for each scenario the overview display be brought up and used for detection of link problems. Once this display points out a problem, then the other displays can be used to isolate the problem to the equipment level at a site. Following this meeting, as the test results show, the controllers became more organized in their DATEC system usage.

HIGH LEVEL MUX FAILURE - POWER SUPPLY (SBL)

PROCEDURE	DATE	TIME
BB1. At SBL, remove the LINE fuse from the Power and Alarm module of the NORMAL TI-4000. Record the time.	6-2-77	1053
BB2. At completion of the test, replace fuse in TI-4000 equipment.	6-2-77	1125

CONDUCTED BY C L Christney 6-2-77

OBSERVED BY ______________

DATEC SYSTEM EVALUATION WORKSHEET 2 June 77 Pg #2

OBSERVANCE (key points only)	PRINTOUT REF (ATTACH)	DATE	TIME
A waiting tst # 2...////RR			1032
CRT shows alarms at GSH .. appears he has switched to "B" side of T14000.also showing SW Minor alarm at SBL..	9/2 June 77		1054
Have cheked all other displays including voltage and all appears fivers.. Still showing SBL on the "B" side of T14000... Unsure A TT why he has switched Requesting maintenance there to chker out..//RR			1118
Honeywell advsd that we shud be able toisolate further, so did a re-run of displays, and on this one, the +5 and -6 Vdc pwr spply at SBL appear bad. Advsd maint of this... NOTE... These did not appear bad on the first two (2) runs of the maintenance voltages...///RR	10/2 June 77		1125
Problem resolved.. SBL corrected trbls with pwr supplies.. Still don't know why CRT did not display problem originally...////RR			1126

TECH CONTROLLER ______

OBSERVED BY ______

#9 2 June 77

	M JOR	*	.		TX PROB		.	
	SW MINOR	*	.	*	RX PROB		.	
	MAJOR	AB	.	A			.	
STATUS	TX IN SVC	A	.	B	TX IN SVC	A	.	A
	RX IN SVC	B	.	B	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	29.679	.	40.333
					EYE MARGIN	9.6090	.	12.459
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8065	.	-8.9677
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.7E-11	.	5.5E-13

PAGE 1

IQ-005 LINK STATUS TIME 153/1054:48

		T1-4000 HUA		T1-4000 SBL		RADIO HUA		RADIO SBL
ALARM	SW MAJOR	*	.		TX PROB		.	
	SW MINOR	*	.	*	RX PROB		.	
	MAJOR	AB	.	A			.	
ˉATUS	TX IN SVC	A	.	B	TX IN SVC	A	.	A
	RX IN SVC	B	.	B	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	29.679	.	40.333
					EYE MARGIN	9.6090	.	12.459
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8065	.	-8.9677
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.7E-11	.	5.5E-13

PAGE 1

! LINK STATUS TIME 153/1059:06

		T1-4000 HUA		T1-4000 SBL		RADIO HUA		RADIO SBL
ALARM	SW MAJOR		.		TX PROB		.	
	SW MINOR		.	*	RX PROB		.	
	MAJOR		.	A			.	
STATUS	TX IN SVC	A	.	B	TX IN SVC	A	.	A
	RX IN SVC	A	.	B	RX IN SVC	A	.	A
	MAINT		.		MAINT		.	
PARAMETER	FER	<1.ØE-7	.	<1.ØE-7	RX SQUELCH		.	
	CRFRM		.		RSL MARGIN	29.679	.	40.556
					EYE MARGIN	9.6090	.	12.459
	BER COR	NO DATA	.	NO DATA	EYE AMPL	-8.8065	.	-8.9677
					EYE HITS	Ø.Ø	.	Ø.Ø
					DER BER	1.7E-11	.	5.5E-13

PAGE 1

```
TIWBI        :        :
             :        :
             :        :
             :        :
          ......................
TELEMETRY.            :        :
SITE     :            :        :
```

#/10

2 June 77

```
AS-1                             LINK STATUS                 TIME  153/1108:10
                              ......T1-4000......              ......RADIO......
                                HUA          SBL                 HUA        SBL
   ALARM       SW MAJOR                .                 TX PROB           .
               SW MINOR                .     *           RX PROB           .
               MAJOR                   .     A                             .
   STATUS      TX IN SVC        A      .     B           TX IN SVC    A    .    A
               RX IN SVC        A      .     B           RX IN SVC    A    .    A
               MAINT                   .                 MAINT             .
   PARAMETER   FER           <1.ØE-7   .<1.ØE-7          RX SQUELCH        .
               CRFRM                   .                 RSL MARGIN  29.487 . 41.333
                                                         EYE MARGIN  1Ø.789 . 12.459
               BER COR       NO DATA   .NO DATA          EYE AMPL   -8.8065 .-8.9677
                                                         EYE HITS       Ø.Ø .   Ø.Ø
                                                         DER BER    4.4E-12 . 5.5E-13
                                                                         PAGE 1
MAC  -18-23                   MAINTENANCE VOLTAGES - SBL     TIME  153/1119:18
```

NO.	NAME	VOLTS	C	RH	AH	CG	AL	RL	MEAN	DEV	INITIAL DATE
Ø1	TIWBI+15	15.2	G	16.5	15.7	15.Ø	14.2	13.5	15.2	Ø	153/Ø911
Ø2	TIWBI+12	12.3	G	13.2	12.6	12.Ø	11.4	1Ø.8	12.3	Ø	153/Ø911
Ø3	TI4ØØØ+5	.375	R	5.5Ø	5.25	5.ØØ	4.75	4.5Ø	4.95	Ø	153/Ø911
Ø4	TI4ØØØ-6	.ØØ7	R	-5.4Ø	-5.7Ø	-6.ØØ	-6.3Ø	-6.6Ø	-6.Ø4	Ø	153/Ø911
Ø5	RADIO+24	24.1	G	26.4	25.2	24.Ø	22.8	21.6	24.1	Ø	153/Ø911
Ø6	RADIO-2Ø	-2Ø.1	G	-18.Ø	-19.Ø	-2Ø.Ø	-21.Ø	-22.Ø	-2Ø.1	Ø	153/Ø911

6.1.23 The Ease with which Data Base Changes Most Frequently Required During Operation Can Be Accomplished

In the DATEC system, the operator has been given the ability to observe the contents of the data base with the access command. In order to change it or to enter new data, he must use the change command. The data base items that can be changed are listed below in the order of frequency of change.

a. Alarm thresholds

b. Site alarm trend table

c. System statistics

d. Site thresholds

The alarm thresholds are a set of nine numbers as shown in Figure 6-10. They are used by the alarm module to determine a specified parameter's alarm color. This is done by determining where the parameter's value falls with respect to the threshold values. The hysteresis areas were incorporated to prevent alarm flicker or the oscillation of alarm color due to slight variations in parameter value. If a parameter's value falls in a hysteresis area, its alarm color is set to the color from which it came.

The DATEC system is presently capable of storing 140 sets of alarm thresholds. To change the thresholds, the operator merely types in the following command:

!NC,CH,AT,n

Where n represents the set of thresholds desired. The computer responds with:

ENTER ITEM NUMBER

The operator is now expected to enter a number from 1 to 9 representing one of the threshold values that he wishes to change. Upon entering this number, the computer responds with:

ENTER FLOATING POINT VALUE

The operator must then respond with the threshold value. The computer continues requesting the item number and value until the operator terminates the process by entering a "NEW LINE" character in response to the item number request.

This command was used more frequently than any other data base command. It was used to set up the validation test thresholds, the system scenario thresholds and the DR8A radio thresholds. As seen from its structure, it is very easy to learn and use. A complete set of thresholds can be entered in approximately two minutes.

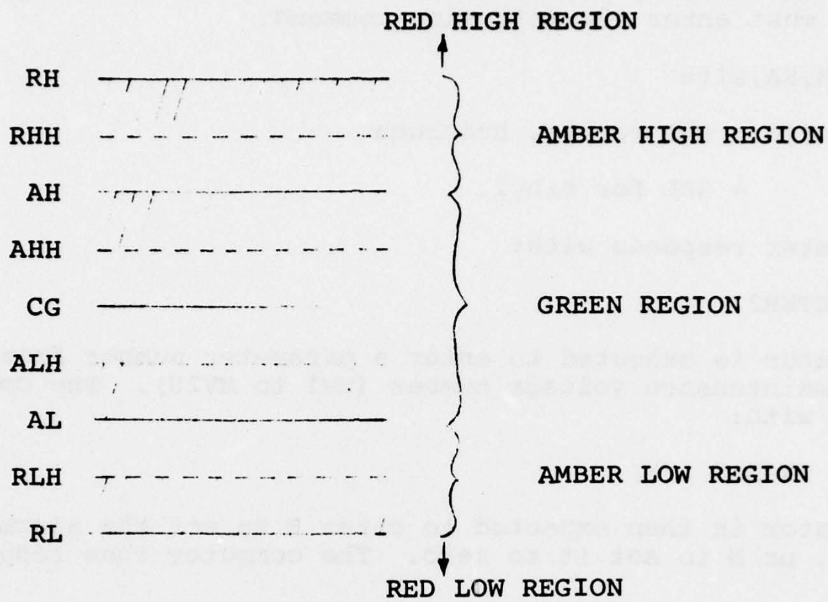

FIGURE 6-10. ALARM THRESHOLDS

Parameters can be enabled or disabled for alarming and trending in the DATEC system. This is done by changing the Site Alarm Trend table which contains three pieces of information for each parameter.

1. Alarm enable bit. This bit is set to 1 to enable a parameter for alarming and to 0 to disable alarming.

2. Alarm threshold indicator. This is a number from 1 to 140 indicating the alarm threshold set to be used for alarming.

3. Trend enable level. This is a two bit field indicating the type of trending to be performed on a parameter. It can have the following values.

   0 = No trending

   1 = Compute last hour, last 24 hours, last 30 days, last 30 months sums only.

   2 = Compute mean and standard deviation for the same time periods as in 1.

   3 = Compute sums for last hour and last 24 hours. Compute mean and standard deviation for last 30 days and last 30 months.

In order to enable a parameter for alarming and trending, the operator must enter the following command:

!NC,CH,SA,site

Where: site = HUA for Ft. Huachuca

= SBL for Sibyl.

The computer responds with:

PARAMETER?

The operator is expected to enter a parameter number from 1 to 39 or a maintenance voltage number (MV1 to MV20). The computer responds with:

ALARM ENABLE E/N

The operator is then expected to enter E to set the alarm enable bit to 1, or N to set it to zero. The computer then responds with:

ALARM THRESHOLD INDICATOR?

The operator must enter a number from 1-140 indicating the set of thresholds desired. The computer then responds with:

TREND ENABLE LEVEL?

The operator is then expected to enter a number from 0 to 3. Following this entry, the parameter question again appears. This process is repeated until all desired parameters are set up.

The structure of this command is seen to be quite simple. It leads the operator through the entry process requiring little or no knowledge of how the command works. This command was used in setting up the data base for the validation tests, system scenarios and DR8A radio tests. Examples of its use are contained in the software log books 1159 and 466 included as Addendum to the Field Test and Evaluation Report. Both the HUA and SBL site alarm trend tables can be set up in approximately 30 minutes. Single parameter changes can be made in less than a minute.

The trend algorithm keeps statistics for the last hour, last 24 hours, last 30 days and last 30 months. Up to 34 current values, 24 hourly values, 30 daily values and 30 monthly values are maintained as historical data. The operator can look at this history by entering the following command:

!NC,AC,SS,site

Where: site = HUA for Ft. Huachuca

= SBL for Sibyl.

The computer responds with:

PARAMETER?

The operator responds with the parameter number (1-39) or a maintenance voltage number (MV1-MV20). The computer responds with:

TIME PERIOD?

The operator is expected to enter:

H - For hourly values

D - For last 24 hours values

M - For last 30 days values

T - For last 30 months values

The computer then prints out the historical data requested.

This command was used extensively by the tech controllers during the system scenario tests. They used it to track the history of a parameter to determine if it was degrading during the course of the relatively short scenarios.

The site thresholds table contains the thresholds used in computing RSL Availability, Eye Availability, Hit Counts and FER Availabilities. The operator can change this table by entering:

!NC,CH,ST,site

Where: site = HUA for Ft. Huachuca

= SBL for Sibyl.

The computer responds with:

ENTER ITEM NUMBER

The operator is expected to enter a number from 1-8 representing the A or B threshold for the parameter mentioned above. The computer responds with:

ENTER FLOATING POINT VALUE

The operator is expected to enter the new threshold value.

This command was never used during validation or system scenario testing. It was used only to change thresholds when the DR8A radio testing was done.

6.2 SPECIAL SOFTWARE CONSIDERATIONS

The S.O.W. for the ATEC Digital Adaptation Study delineated several tasks/considerations in Paragraph 6.2.1 associated specifically with software. Inputs for this section were derived in large part from entries in software log books, observations made during field tests, and discussions with the technical controllers who took part in the System Simulation Scenarios. These specific items are addressed in the following subparagraphs.

6.2.1 Visibility of the Software Program Codes Logic/Structure, and Whether the Structure Will Allow Quick Isolation of Software Problems

Software Structure

The Digital ATEC software was designed using a top-down approach in which the statement of work was used to define some initial functions. Each of these functions was in turn further refined which resulted in the definition of additional functions of a simpler nature. The refining process continued until a set of basic functions were defined. The modules shown in Figures 6-11 through 6-15 were developed to implement those functions. These hierarchy diagrams give an accurate description of the software structure. One can determine what functions are performed by a module by observing the row of blocks immediately below the single defining block. For instance, the nodal control scan module (module 1.0) does the following:

1. Select monitor point (module 1.1).
2. Input major alarm summary data (module 1.2).
3. Input alarm summary data (module 1.3).
4. Input MAC voltage data (module 1.4).
5. Compute, alarm, trend parameters (module 1.5).
6. Output display (module 1.6).
7. Initialize baseband eye monitor (module 1.7).

Although the hierarchy diagrams give a good indication of the software organization, they tell nothing about data flow. This is accomplished by means of a HIPO diagram. One of these exists for each module described in the hierarchy diagrams. The HIPO diagram describes what the module does and shows the inputs used and outputs generated. As an example, the HIPO for module 1.3 is shown in Figure 6-16.

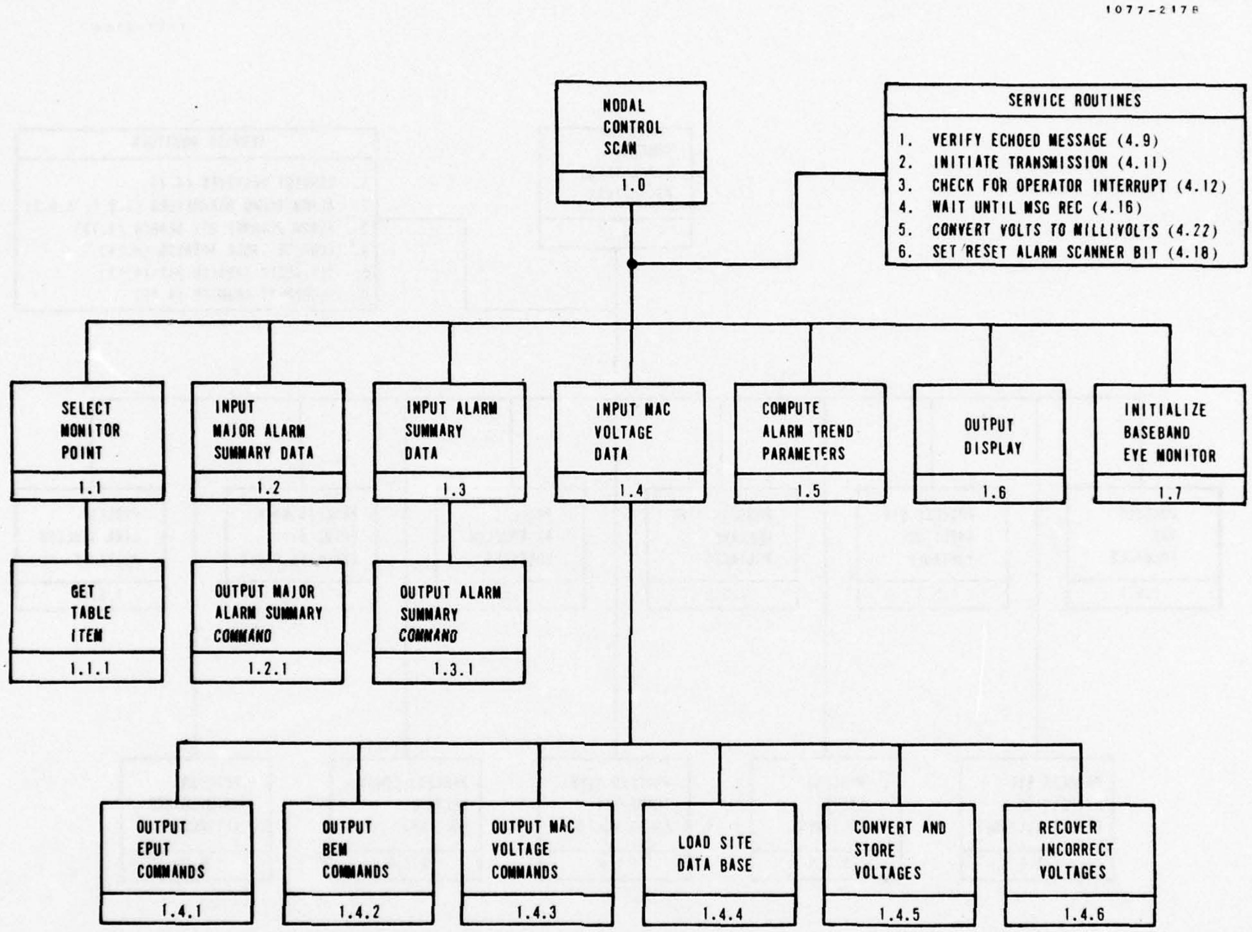

FIGURE 6-11. NODAL CONTROL SCAN HIERARCHY

1077-216B

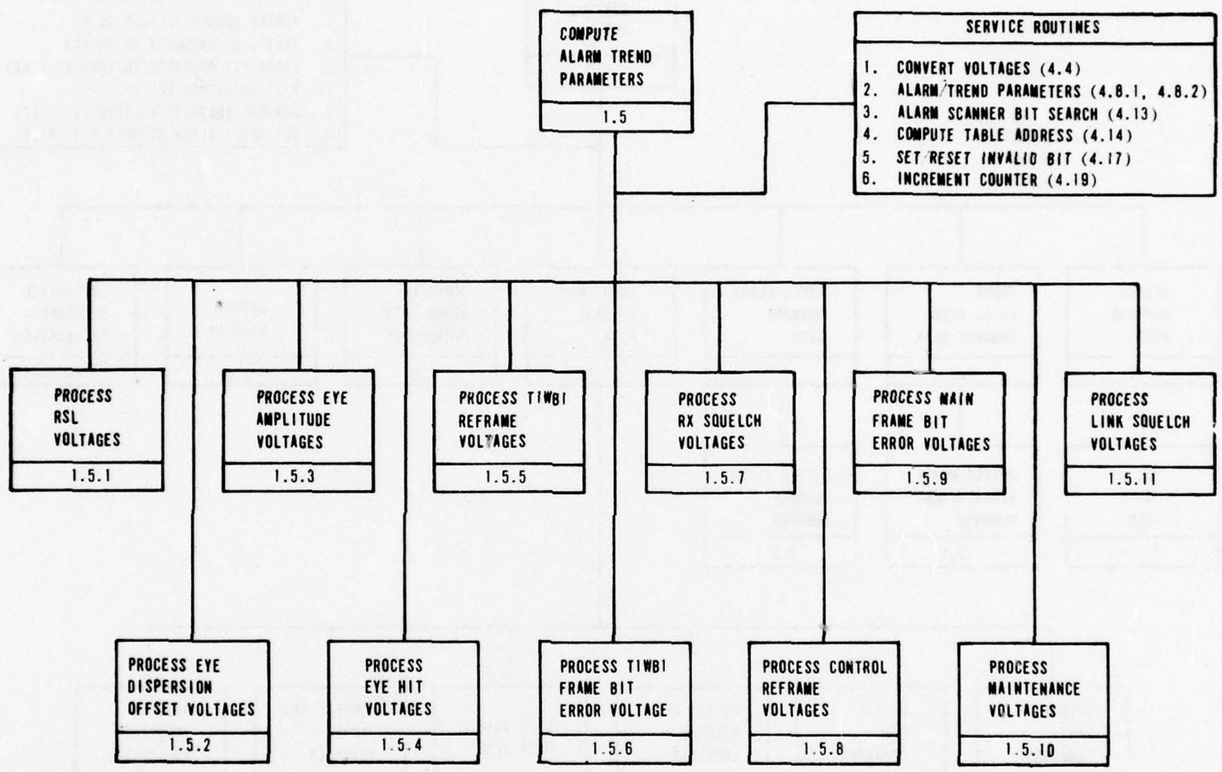

FIGURE 6-12. COMPUTE/ALARM/TREND PARAMETER HIERARCHY

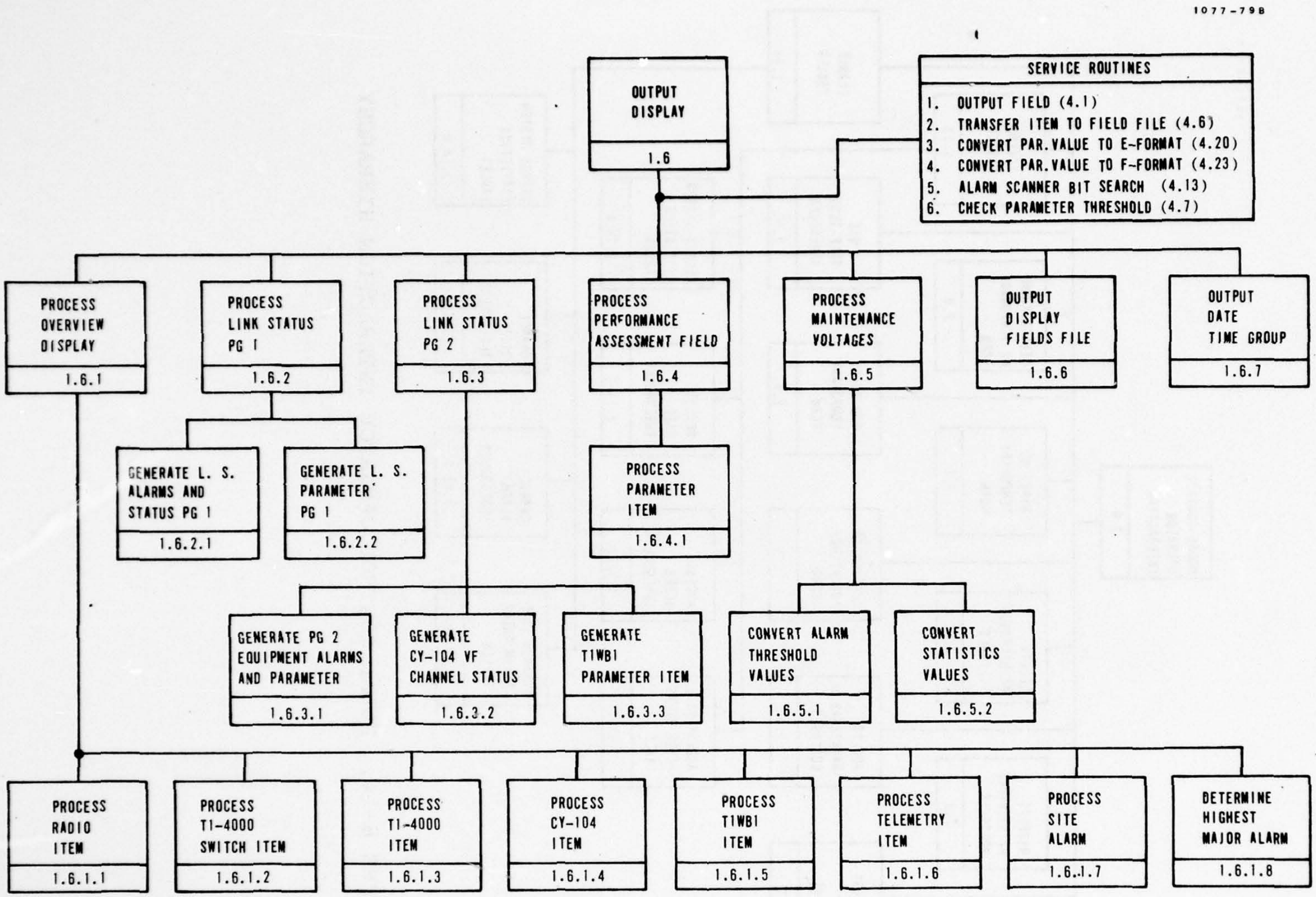

FIGURE 6-13. OUTPUT DISPLAY HIERARCHY

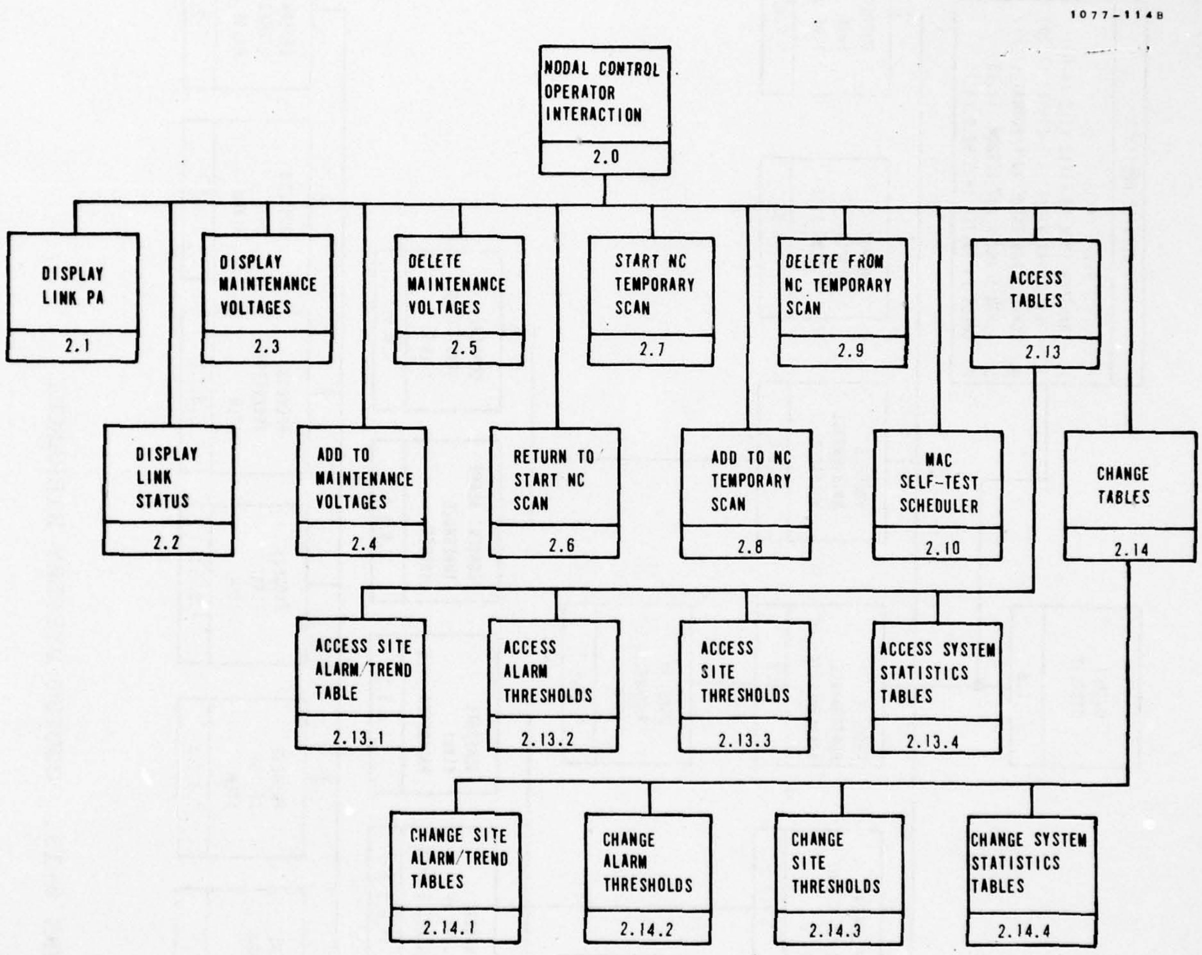

FIGURE 6-14. NODAL CONTROL OPERATOR INTERACTION HIERARCHY

AD-A051 926 HONEYWELL INC ST PETERSBURG FL AVIONICS DIV F/G 17/2
ATEC DIGITAL ADAPTATION STUDY, DEVELOPMENT AND FIELD EVALUATION--ETC(U)
JAN 78 T J CAMPBELL, W F ACKER, C L CHRISTNER F30602-75-C-0282
UNCLASSIFIED 1077-14813-VOL-2 RADC-TR-77-431-VOL-2 NL

4 OF 4
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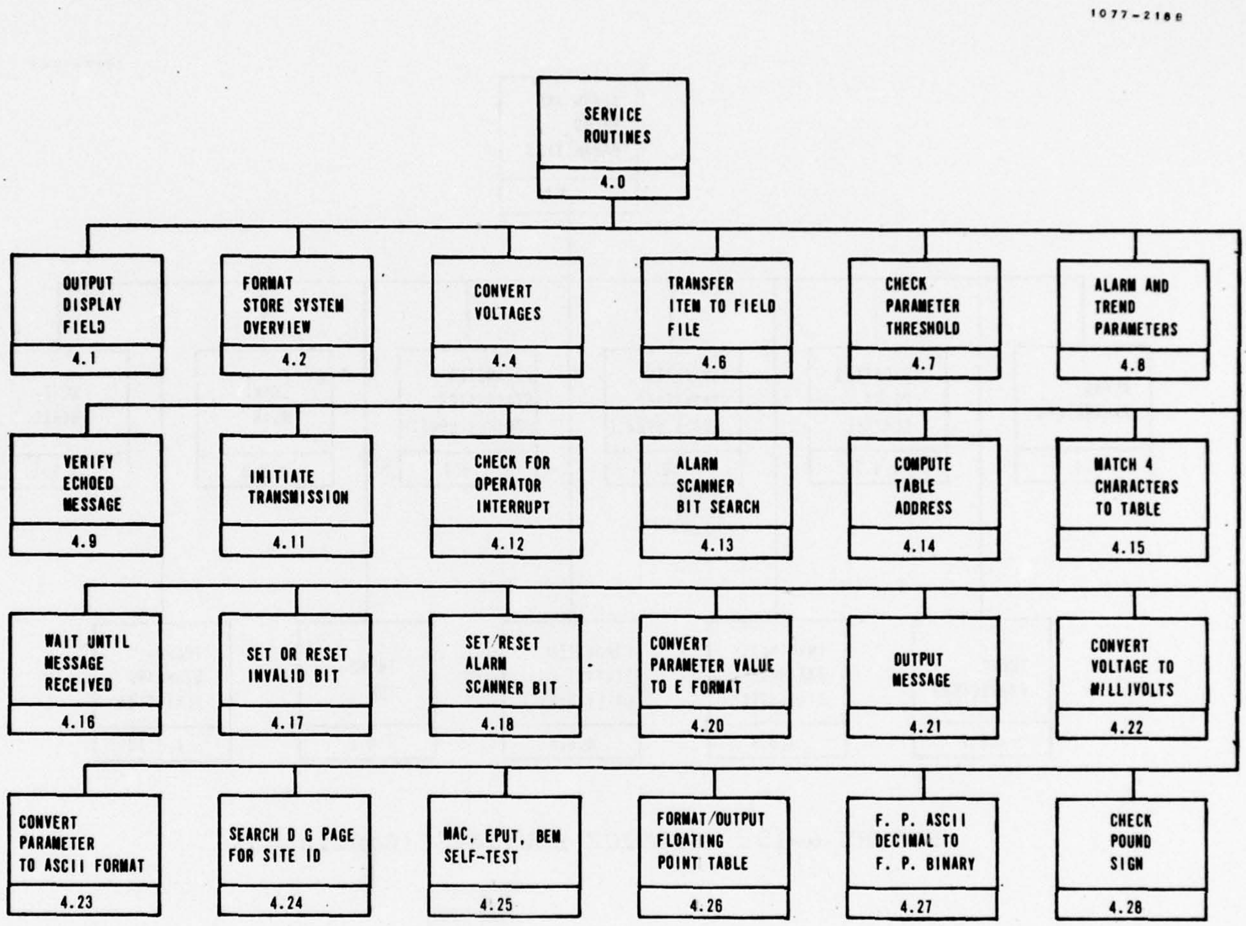

FIGURE 6-15. SERVICE ROUTINES

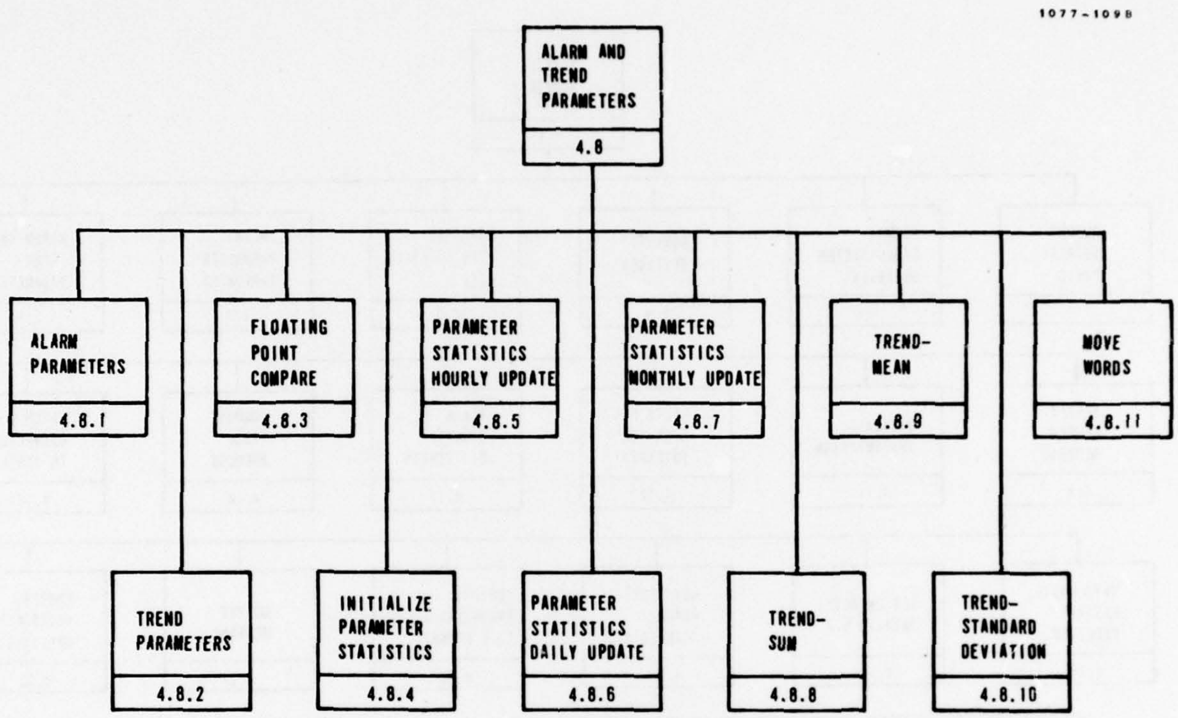

FIGURE 6-15. SERVICE ROUTINES (Continued)

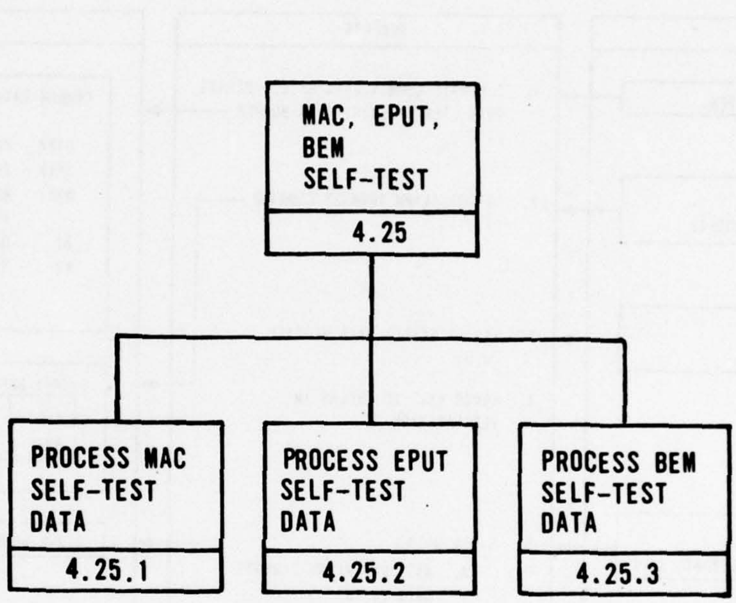

FIGURE 6-15. SERVICE ROUTINES (Continued)

1077-227B

HIPO NO.: 1.3 AUTHOR: DTD DATE: 7/27/76

TITLE: Input Alarm Summary Data

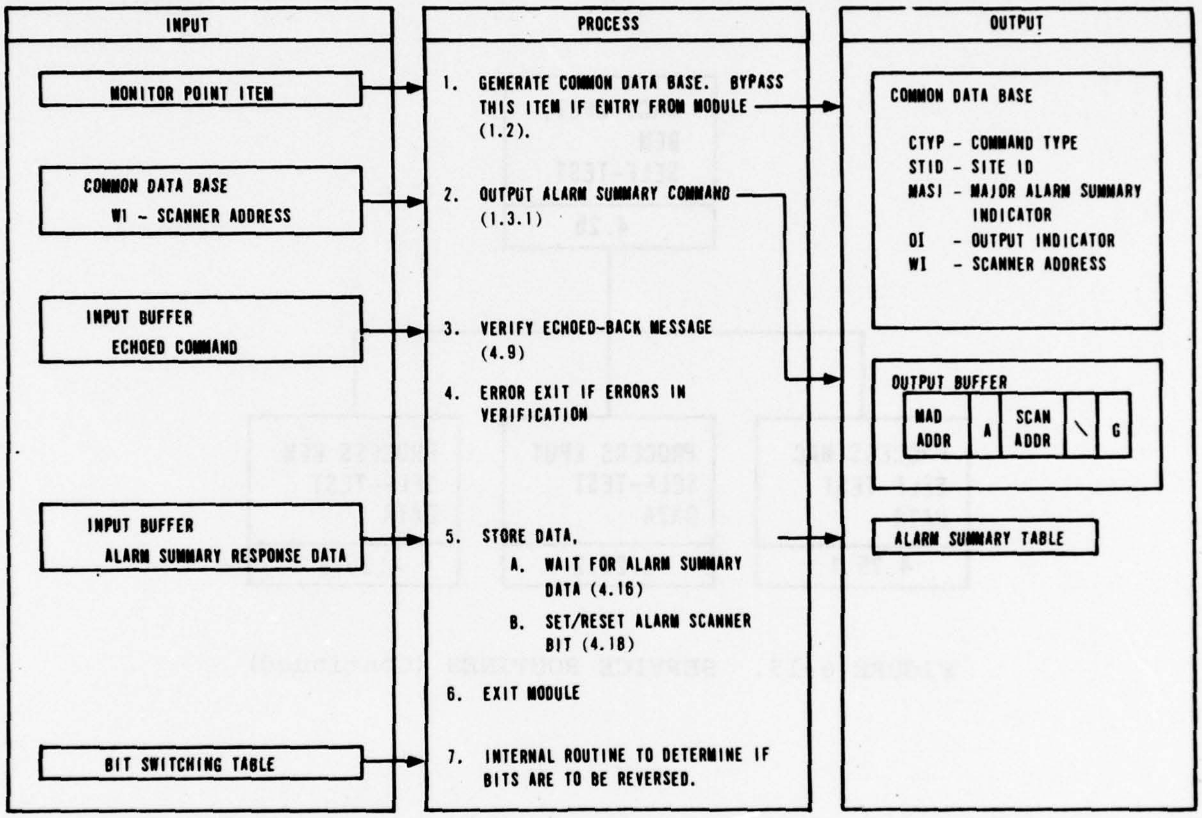

FIGURE 6-16. HIPO DIAGRAM

The software and data structure described in the hierarchy and HIPO diagrams allow for quick isolation of software problems. As an example, Figure 6-17 summarizes the HIPOs for the nodal control scan module (1.0). The input modules (1.1 through 1.4) get data from the monitoring devices (MAD, MAC and IQCS) and store it in the alarm scanner table, the site voltage table and the VF table. The processing modules (1.5) use the data in these tables for computing, trending and alarming parameters. The results of this processing is stored in the parameter value table, statistics tables, and alarm trend tables, respectively. The display modules use all the above tables for creating display presentations. By having a set of tables between the input, processing and display modules, one merely has to interrogate the tables to isolate the set of modules causing the problem. The logic used in this process is described in the following example of "Pseudo Code".

```
If alarm scanner problem

   If alarm scanner table tracks alarms

         check display modules

   Else

         check alarm scanner input modules.

If parameter value problem

   If voltage in site voltage table does not agree with
   observed

         check voltage input modules

   Else

   If parameter value agrees with computed value

         check display modules

   Else

         check processing modules.
```

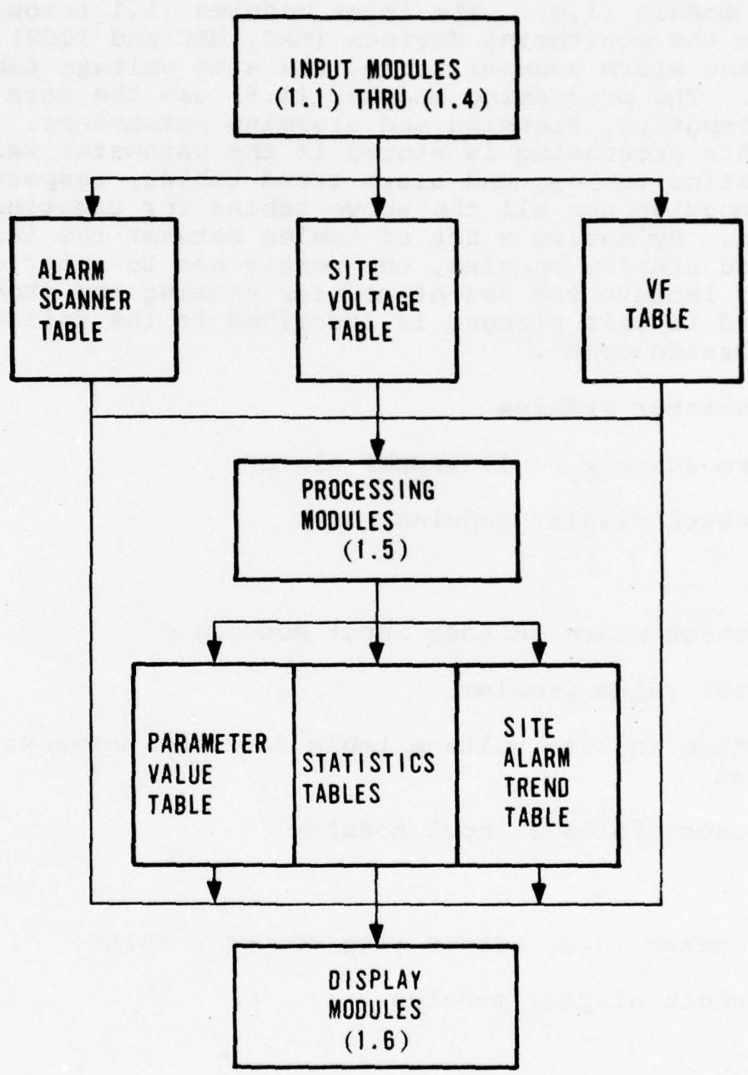

FIGURE 6-17. NODAL CONTROL SCAN MODULE

6.2.2 Adequacy of Software Debugging Aids to Provide Information that is Useful in Error Detection and Tracing

Software Development and Debugging

The PATE system has 16,384 words of core storage. Approximately half of this is used by the PATE executive and associated software. This code is in core all the time and is known as resident core. The remaining 8K of core is available for applications programs. If an application requires more than 8K it must be partitioned into 8K sections, each being brought into core and executed in a sequential manner.

The digital ATEC software requires more than 8K to satisfy all its requirements. It was partitioned as follows:

1. Nodal Control Scan Task. Module 1.0, associated modules, service routines and PATE utility routines.

2. Nodal Control Operator Interaction. Module 2.0, associated modules, service routines and PATE utility routines.

3. Output Display Task. Module 1.6, associated modules, service routines and PATE utility routines.

4. DATEC Self-Test Task. Modules 4.25, 4.25.1, 4.25.2, 4.25.3, service routines and PATE utility routines.

5. Data Base Generation Program. A utility routine that allows accessing and changing floating point numbers.

Each of these tasks is represented by a punched paper tape which can be loaded onto the PATE disk by means of the TermiNet tape reader. These tapes are generated in the software development facility (SDF) in the plant at Honeywell. This development process is illustrated in Figure 6-18.

Each module is coded, punched on cards (1) and placed in a library of source files on the disk (2) in the SDF. Once a source file is on disk, it can be changed or corrected by entering correction cards (3) on to a disk update file (4). This file is in turn used by the source update program (5) to modify the disk source file (2).

The assembler program (6) reads a specified source file (2) and generates an object file (7) which can be read by the loader. It also generates a program listing of the specified module which is kept in a binder for reference purposes.

After all modules making up a task are in the object file state, a paper tape can be generated. This is done by entering a card deck (10) of source file names making up the task. The

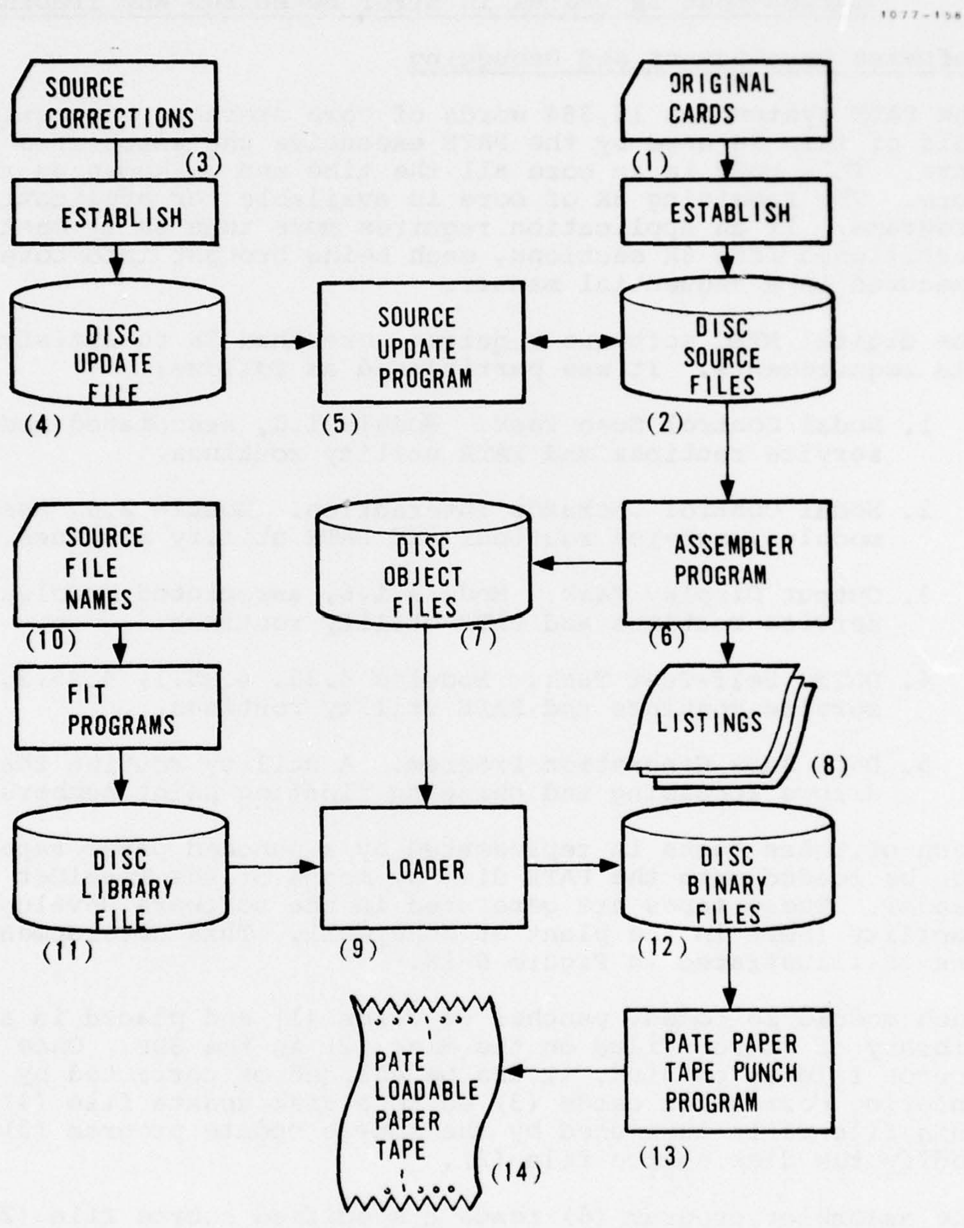

FIGURE 6-18. SOFTWARE DEVELOPMENT PROCESS

fit programs search all source files in this list to determine their respective sizes and generates a disk library file (11) consisting of the object file names in the order that they are to be loaded. This file is ordered by the fit programs so as to minimize cross sector linkages. The loader program (9) loads the object files (7) as specified by the disk library file (11). The output of this loading process is a binary file (12) placed on the disk. The data in this file is in core image format which can now be read by the PATE paper tape punch program.

The debugging process used on the host computer both in-plant and in the field is shown in Figure 6-19.

The paper tapes generated in the SDF are loaded onto the PATE disk by means of the termiNet loader program (1). Corrections can be made to the PATE disk without new tape generation by means of the Patch program (2). With this program, a programmer can bring a task into core, make changes to it and have it written back to disk. This provides a rapid means of making module changes and testing them on the host computer. Once a change is made in this manner, the task on the disk is no longer the same as the paper tape that was originally loaded. During debug the programmer therefore records all patches in a software log book (5) specifying the module name and task name. If for any reason a task is destroyed on the disk the programmer just reloads the paper tape and reenters all patches recorded in the log book to recover.

During in-plant debugging when the SDF was in close proximity, one or two pages of patches were accumulated in the log book before the source files were updated and new tapes generated. In general, programmers tended to keep paper tapes as current as possible.

Debugging in the field was handled a little differently since the SDF was not available. The patch program was used extensively to make corrections and modifications. These were carefully recorded in the software log book. In addition, a disk back up system was used. The PATE disk has a fixed disk and a removable disk. These two packs contain the same information. When a task is patched it is written to both the fixed and removable disks. A three disk cycle was used to save information and provide backup capability. After patching a task the removable disk is taken off the drive and replaced by the oldest disk in the cycle. The disk utility program (4) is then used to copy the fixed to the removable. If the disk was ever destroyed, the latest backup could be used to restore the system.

The software development and debugging procedures described were quite effective in both in-plant and field checkout. They were simple to use and learned in a minimum amount of time by new programmers. The many software improvements, some quite

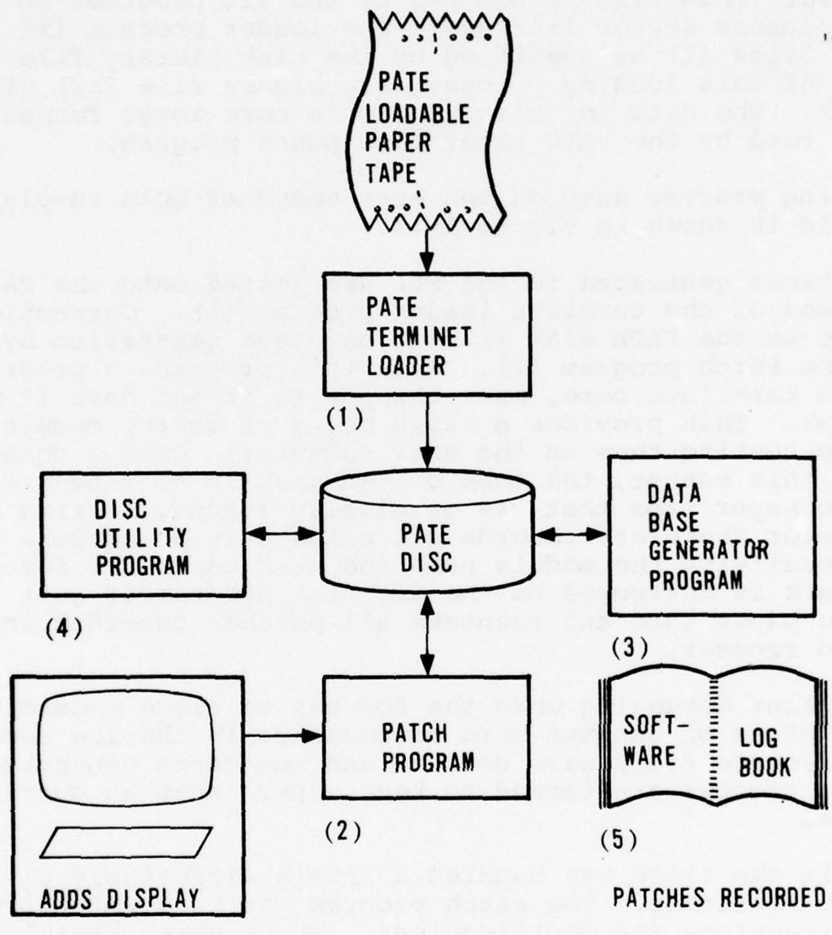

FIGURE 6-19. IN-PLANT AND FIELD CHECKOUT PROCESS

extensive, would not have been possible without these techniques. During the length of testing at Ft. Huachuca, there was no time lost because of software problems. This can be directly attributed to the debugging and backup procedures used.

6.2.3 Usefulness of Error Messages and Diagnostics that are Provided When the System Fails

The PATE and Digital ATEC software was designed to prevent catastrophic software problems due to system failures. These problems usually occur because of the inability of the software to respond to bad data entered as a result of system failures. Data is input to the Digital ATEC software through the data line controller (DLC) representing MAC/MAD inputs, the ADDS/TERMINET in the form of operator interaction and program loading, and the disk representing task loading and data file input. The software has provided protection in all these input areas as follows:

1. Data Line Controller. The upper left hand corner of the ADDS display has been reserved for the scan status and error messages. During the scanning process the latest command is printed on line one and line two shows the results of the command. No printouts indicates no problems. The message MAX RETRANS indicates that the command was transmitted three times due to garbled data or error responses from the MAC or MAD before going to the next command. The message NO RESPONSE indicates that expected data has not been received.

   These messages proved to be quite useful during field testing. The line one message gave the operators an indication of where the system was in the scanning process and if a message occurred on line two it usually indicated that the device commanded was inoperative. It is important to note that the presence of an error message did not halt the software, cause it to go into an infinite loop, or allow bad data to enter the data base. The problem is merely noted and then the next command is selected.

2. ADDS/TERMINET. Data is entered through the ADDS during operator interaction. The error messages were found to be adequate during operator inputs. The most common message was ERROR. Although this is a general message meaning that the command was entered incorrectly, it was observed that the operators had no problems determining their errors when it occurred. The next most common error was FLOATING POINT VALUE IN ERROR, which usually meant that the decimal point was left out in entering floating point data.

   At no time during field test did an erroneous input by the operator cause catastrophic software problems. There was one minor problem encountered when the new Monitor

Immediate code was entered in the field. The operator entered a starting item that was greater than the ending item which caused Monitor Immediate to go into an infinite loop. This was corrected in the field.

3. Disk. Software tasks and data are constantly being loaded into core from the disk and updated data bases are being written to disk during normal operating conditions. If the disk fails software must be available to prevent corrupted data from entering memory or being written to disk. The PATE operating system provides for disk error detection by checking the disk hardware status after each read or write operation. If an error occurs, the software attempts to recover by copying the fixed disk to the removable. If this cannot be done, the message ERROR DURING COPY is printed and the operator is given the choice of repeating the operation or fixing the disk. This error message occurred twice during field testing. Once when a software bug caused the disk to be reformatted, and a second time when the disk failed. The disk diagnostics were run for the disk failure and pointed out that the disk was experiencing sector miscompares. This eventually led to replacement of an option card in the disk.

6.2.4 Ease With Which Software is Debugged Both On-Site and at the Honeywell Plant

There were a total of 54 software and data base changes made during field test operations. Only nine of these changes were because of bugs. The rest were either to improve the existing software or to add a new feature that was overlooked in the original design.

Following is a description of the nine software bugs and how they were isolated and corrected.

Bug No. 1. Bad eye hits calculation. This bug was manifested as an eye hit value on the link status display that was grossly higher than expected. The debugging technique described in Paragraph 6.2.1 was used to isolate the problem to the calculation modules, in particular, module 1.5.4 (Process Eye Hit Voltages). In checking the calculation of the eye hit rate, it was found that the time base constant for the BEM EPUT was entered as an integer number instead of floating point. This was corrected with the use of the data base generator program (DB). The bug was detected and corrected within 10 minutes.

Bug No. 2. Loss of hourly statistical data when new day begins. This bug was detected while observing the statistics collected during an overnight test run. It was noticed that the RSL scan count was normally 15 or 16 for each hour in a 24 hour period except for the hour just after midnight. Its value for this hour was one. This immediately led one to believe that there was a problem in the trending module in the area of determining when an hour had elapsed. By tracing through the hierarchy and HIPO diagrams, it was found to be module 4.8.2. The problem was corrected by using the PATCH routine. It took approximately one hour to detect and correct the problem and another 24 hours test run to verify the fix.

Bug No. 3. Erroneous data printed during access of system statistics. This bug was detected while accessing system statistics with operator interaction. It was observed that when the hourly, daily, monthly or 30 month values were requested a second time for the same parameter that they would be different from the first. By tracing through the hierarchy diagram for nodal control operator interaction, it was found that module 2.13.4 performed the function of accessing system statistics. In checking the code it was found that the parameter number was not being reinitialized properly for multiple requests for the same parameter. The module was corrected with the patch routine. This problem was detected and corrected in approximately 25 minutes.

Bug No. 4. Incorrect Eye B Availability calculation. This bug was detected when it was noticed on the Link Performance Assessment display, Page 1, that the Eye Availability for the B radios at both sites did not change when expected. The isolation technique previously described was used to determine that the display modules were at fault. It was found in tracing through the hierarchy diagram for module 1.6 that module 1.6.4 processes the Link Performance Assessment display. It was found upon inspection that the display generator table driving the module had incorrect pointers to the B Eye Availability parameters. The correction was made with the patch routine. Total time to isolate and correct the problem was approximately 10 minutes.

Bug No. 5. Alarm color not determined properly. This bug was detected when it was observed on the Link Status display, Page 1, that the alarm color for the Eye Amplitude parameter was not being determined properly. This parameter used alarm threshold number 14. Other parameters with threshold indicators less than 14 were being alarmed properly. Since there are 14 sets of alarm thresholds per disk page, it was concluded that there was probably an error in the disk page number calculation in module 4.8.1 (ALARM PARAMETERS). This proved to be true upon further investigation. The problem was corrected with the patch routine. The total time to detect the problem, correct it and verify the fix was approximately 45 minutes.

Bug No. 6. Clobbered disk problem. This problem was detected as disk errors during normal operation. Attempts to restart the system failed, indicating that the disk had been clobbered. The system could be restored only by copying the fixed disk to the removable. The problem first appeared to be intermittent in nature, but upon further investigation of memory when the problem occurred it was found that module 1.0 was in core and that the trending module (4.8.2) was the last module called. It was finally determined that the problem occurred when the current day and time were less than the start day and time for statistics. Knowing this, the problem could be made to occur at any time. By using the patch program to place halts in the program flow, the problem was finally traced to two modules (4.8.9, TREND MEAN, and 4.8.10, TREND STANDARD DEVIATION) which had improper returns in an area of code entered as a result of the problem perturbation. The detection and correction of this problem took approximately two hours after it could be made to occur at will.

Bug No. 7. Computer halt problem. This bug was detected when the computer halted in the floating point multiply routine. This is a PATE routine used in ATEC software. It was found that the routine was coded to halt when an underflow condition occurred in the floating point accumulator. This was changed using the patch routine to return a zero instead of halting. The time to detect and correct the problem was approximately 15 minutes.

Bug No. 8. Improper maintenance voltages. This bug was detected when it was observed that the maintenance voltages for the T1-4000 were not being updated on the Maintenance Voltages display when fuses were pulled while the T1WB1 and radio voltages were changing as expected. The isolation technique previously described was used to determine that the problem was in the calculation modules (module 1.5.10, Process Maintenance Voltages). It was found that the data base file that drives this module had some incorrect pointers. These were changed with the patch program and the problem cleared. The total time required to isolate and correct the problem was 20 minutes.

Bug No. 9. Improper conversion. This bug was detected as an improper conversion of the floating point availability values. The conversion module 4.23 is supposed to convert to 5 significant figures. It was observed that values greater than 0.99328 were only being carried out to four significant figures. The problem was traced to an inaccurate conversion constant. This problem was detected and corrected within approximately 45 minutes.

6.2.5 Meantime for Detection/Isolation of Software Errors

The following is a summary of the approximate times for detection/isolation of software errors previously discussed in Paragraph 6.2.4:

*Bug No.	Time to Detect/Isolate (Minutes)
1	3
2	20
3	15
4	3
5	20
6	80
7	10
8	13
9	10

This results in a meantime for detection/isolation of 19 minutes for each software error.

6.2.6 Meantime to Modify the Code When Corrective Action is Required

Following is a summary of the times required to modify code when corrective action was required as a result of the software errors previously discussed in Paragraph 6.2.4:

*Bug No.	Time Required to Correct (Minutes)
1	7
2	40
3	10
4	7
5	25
6	40
7	5
8	7
9	35

This results in a meantime for code modification of 20 minutes for each software error.

---

* No. assigned in Paragraph 6.2.4.

6.2.7 Extent to Which Software Modification and Checkout is Required

Following is a summary of the modifications made to the software and bugs found and corrected. A description of the change and a reference to the software data book (included as Addendum 2 to the Field Test and Evaluation Report) containing the actual patch is given. Those items marked with an asterisk (*) are the software bugs found.

FIELD CHANGES TO DATEC SOFTWARE AND DATA BASE

1. Modified data base (DG, PD) to accommodate alarm scanner hardware change. (18, 19, 20, 21 switched to 20, 21, 18, 19) Data Book 1159, page 87.

2. Patched operator interaction (CN) to allow scanning during LPA and maintenance displays. Schedules NT following OD. Patched TV to bypass operator interrupt code. Data Book 1159, page 88.

3. Provided flashing major alarm indication and audible alarm at the ADDS whenever major alarm is detected. Data Book 1159, page 89.

4. Patched TV to output a "format off" character (2378) whenever output display task is entered. Data Book 1159, page 90.

5. Patched NS to bypass display update for LPA and Maintenance Voltage displays. Data Book 1159, page 90.

6. Changed conversion factors in PD file for radio voltages from 0.004 to 0.003. Data Book 1159, page 90.

7. Changed name of maintenance voltage No. 2 to "T1WB1+12" for both HUA and SBL. Data Book 1159, page 91.

8. Changed low end of conversion table No. 1 from 0 to 11.587E-9 so that FER for 0 counts will come out 1.0E-15. Data Book 1159, page 91.

9. Eliminated Temporary Scan and added code to NS and CN to provide a Monitor Immediate capability. Data Book 1159, pages 94, 95, 96, 97.

*10. Corrected eye hits bug by changing BEMN from integer 90 to floating point 90. Data Book 1159, page 95.

11. Changed units on LPA page 2 to VLTS in base display file, DF. Data Book 1159, page 98.

12. Entered Dispersion Voltage versus DER BER tables for HUA and SBL (Tables 8, 9, 14, 15). Data Book 466, page 1.

13. Set up IQCS monitor table for channels 5, 6, 7, 8. Data Book 466, page 1.

14. Entered RSL versus DBM tables for HUA and SBL (Tables 10, 11 4, 5). Data Book 466, page 1.

15. Modified alarm threshold No. 3 for +12 volt threshold. Data Book 466, page 1.

*16. Corrected trending bug in NS. Data Book 466, page 2.

17. Set up Data Base for tests B, D and E. Data Book 466, pages 2, 3, 4, 5.

*18. Corrected access statistics bug in CN. Was not reloading page for multiple parameters. Data Book 466, page 5.

19. Set up data base for test F. Data Book 466, page 6.

20. Entered new Table 6 (Dispersion Voltage to Eye Margin). Modified EDIS to accommodate new Table 6. Data Book 466, page 7.

21. Modified PD file to reference only Table 6 for Eye Margin. Data Book 466, page 7.

*22. Corrected data base bug in DG file. Pointer to B Eye Availability was incorrect, HUA and SBL. Data Book 466, page 8.

*23. Corrected bug in alarming module. Was computing page number incorrectly when loading alarm thresholds. Data Book 466, page 8.

24. Set up data base for test G. Data Book 466, page 9.

25. Patched TV to wait after display update to allow operator to print local without problem. Data Book 466, page 10.

26. Patched resident core (RC) to set a flag for the above patch when control W is entered at the keyboard. Data Book 466, page 10.

27. Set up data base for test J. Data Book 466, page 11.

28. Rearranged Monitor Immediate table. Data Book 466, page 12.

29. Patched resident core to provide enable/disable capability on ADDS major alarm audible alarm. Modified NS patch to check enable/disable flag before sounding alarm. Data Book 466, page 13.

30. Patched BEM self-test (TN) to print "90 sec time delay". Data Book 466, page 14.

31. Eliminated "DIF" from "BER COR DIF" field on Link Status, Page 1 display (DF base display). Data Book 466, page 14.

32. Modified Link Status, Page 1 and 2 displays to output "<1.0E-7" in FER field for T1-4000 and "<1.0E-6" in T1WB1 FER field when applicable. Also output "NO DATA" in "BER COR" field. Data Book 466, pages 15 and 16.

33. Set up data base for System Simulation Scenarios. Data Book 466, page 17.

34. Patched NS to alarm but not trend if reframe occurs. Data Book 466, page 18.

35. Patched TV to output 0 if maintenance voltage less than 10^{-5}, Data Book 466, page 19.

36. Patched TV to bypass outputting alarm data when "NO DATA" printed. Data Book 466, page 19.

37. Patched NS to clear major alarms (bits 1 through 5) before major alarm summary. Data Book 466, page 20.

*38. Corrected trending bug in NS. Two routines (TMN and TSDV) omitted IRS before returning. Data Book 466, page 21.

39. Patched NS to output warning message if operator loads resident core without setting time. Data Book 466, page 21.

40. Changed IQCS scan table to eliminate major alarm summary. Data Book 466, page 22.

*41. Corrected bug in NS (MØ22 routine) that caused halt if underflow occurred. Data Book 466, page 22.

*42. Corrected bug in PD file to reference correct maintenance bits. Data Book 466, page 23.

43. Patched TV and CN to insure that the requested site is continually updated on the Maintenance Voltage display. Data Book 466, page 23.

44. Patched NS to OR (i.e., if any channel amber or red) IQCS channel measurements together for LS, Page 2 field. Data Book 466, page 24.

45. Revised statistics patch to correctly calculate hours elapsed since start of statistics. Data Book 466, page 25.

46. Patched TV to reset FLG1 for "NO DATA" print out if "INVLD" exit taken. Data Book 466, page 26.

47. Patched NS to omit in-service check on T1-4000 when in Monitor Immediate mode. Data Book 466, page 26.

48. Changed item 5 of Monitor Immediate table to perform major alarm summary after voltage measurement. Data Book 466, page 27.

49. Changed end point in Table I (Voltage to Mean Count) to reflect new EPUT time base. Data Book 466, page 27.

50. Changed alarm threshold No. 13 (Eye Margin threshold). Data Book 466, page 27.

51. Revised patches on pages 15 and 16, Data Book 466 to reflect increased EPUT time base (from 120 to 210 seconds). Data Book 466, page 28.

*52. Corrected bug in conversion routine ØSPARC that would not create 5 significant digits for numbers greater than 0.99328. Data Book 466, page 28.

53. Changed operator interaction schedular to schedule NC to resume scan when time out occurs. Data Book 466, page 29.

54. Patched statistics to retain data points used to compute hourly means. Data Book 466, page 30.

6.2.8 Degree to Which the Software is Machine Dependent

The Digital ATEC software is written in machine language and is therefore restricted to the 316 computer. It should be pointed out though, that because of the highly visible documentation provided through the use of structured programming techniques, it would be a fairly easy job to provide the nodal control capability in a higher order language.

6.3 ADDITIONAL EVALUATION CONSIDERATIONS

In addition to those items specifically delineated in the S.O.W. which were to have been addressed during field test operations, there were several other topics recommended by RADC for consideration. These topics fall primarily into two groups. The first is directed toward the impact upon skill levels or manning which DATEC might have. The second group is concerned primarily with certain aspects of DATECs output display formats.

6.3.1 Manning Structure

One of the objectives of the DATEC field test was to examine the manning structure required to support a DATEC monitored PCM system cluster. Key manning questions directed towards this area are as follows:

- In what manner can the DATEC system save O&M personnel?
- Assuming some stations were unmanned, determine if and what additional skills or extra manning would be needed at a manned facility providing control of the unmanned site.
- What complement of "five-level" technicians (Air Force Specialty Code Experience Level-5) would be needed to support a total nodal jurisdiction with 16 subordinate stations connected to it?

These questions are addressed in detail below.

6.3.1.1 DATEC System Versus O&M Personnel Requirements

The use of remote monitoring and assessment equipment such as DATEC will result in O&M personnel savings. This is supported by several facts:

a. Due to accurate on-site monitoring and remoting of System/ Equipment parameters and status information to a centralized nodal control station, the need for manning of remote facilities is greatly reduced. This is not totally facilitated by the advent of DATEC but represents a general improvement in facility state of the art equipment design and reliability. This general improvement is enhanced by DATEC allowing the reduction in support manning as discussed below.

b. Since facility performance information is centrally collected and trend analyzed at the nodal control station, the O&M support personnel resources (Maintenance and Operations) can be collected and more efficiently centralized for dispatch to the remote sites as required.

c. Through the use of trend analysis techniques some scheduled maintenance routines at remote sites can be eliminated or their frequency decreased thus reducing maintenance dispatch personnel requirements.

For example, a hypothetical maintenance routine (Preventive Maintenance Instruction) number 31R5-2FRC163-WC-X, Instruction 3.1, may require 1.6 hours per radio rack each week to perform. The objective of the PMI is to measure all power supply voltages in the radio rack, to ensure they are within tolerance. With

16 sites and 2 radio racks per site, this would be 16 x 2 x 1.6, or 51.2 manhours per week just to measure the power supplies.

DATEC could measure all power supply voltages each maintenance scan, and analyze them against tolerance objectives. In addition, trend limits are established to detect variations that can lead to radio failure. This further reduces routine frequency/ manpower requirements as the maintenance dispatch takes on the actual Radio MTBF performance. Dispatch, travel and on-site maintenance time could be reduced to 1/4 its current practice.

A case in point is the maintenance support time required for the unmanned facility at Christmas Common England. The AN/GRC-185 radio requires 120 scheduled manhours monthly and results in four 60-mile round trips requiring 2.4 hours each to and from the dispatch center at Hillingdon. This results in a total of 129.6 scheduled manhours per month. DATEC type monitoring could reduce this total to 33 scheduled manhours a month, eliminating the need for scheduled weekly routine trips to measure voltages and so forth. It is realized that the GRC-185 is an older radio with a lower MTBF than that predicted for the AN/FRC-162 and 163, but is used here only as an example.

6.3.1.1.1 Summary

The field test demonstrated DATEC's ability to measure, collect and analyze system/equipment parameters and status information. The manpower savings that can be recognized through automated instrumentation is not that demonstrable due to the lack of established performance data, maintenance routines and manning data for DEB-FKV facilities. In the maintenance area alone, it can be assumed that based on current maintenance and manning practices that the need for manpower can be reduced as facilities are installed for unattended operation.

This assumption is based on the willingness of the services to allow instrumentation and remote monitoring of facilities/ equipment parameters to replace the existing scheduled maintenance approach.

In the technical control area, it has been estimated* that a 20 percent reduction in control personnel can be recognized through automating technical control functions. This figure includes the addition of ATEC operations personnel (Sector & Nodal), and is supportive to the Defense Communications Engineer Center estimates contained in DCEC Technical Note 5-75.

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* ATEC Cost-Effectiveness Analysis, Honeywell ID Project F8545, Ewing, R.D., Peters, G.L., Tufaner, R.L. Systems Research Center, 7 March 1977.

6.3.1.2 Additional Manning - Skills Requirements

With the unmanning of some subordinate sites, and the centralization of both operational and maintenance functions at the nodal location, additional personnel will be required to support the unmanned facilities. It is not the objective of this discussion to provide a detail manning standard for the 16 station node, but to provide a general synopsis of manning and skill considerations.

a. ATEC Maintenance. As a minimum, two ATEC maintenance technicians will be required per node. Their duties include the support and maintenance of the nodal equipment and remote station equipment. The geographical size and separation of the 16 stations within the node may require additional personnel. This may result in the creation of dispatch work centers at selected non-nodal sites to support unmanned facilities which are geographically too far from the nodal station to offer responsive maintenance support.

b. Equipment Maintenance (AFSC 304XX-FC2659D). The number of radio wideband maintenance personnel required to support the 16 station node fall under the same geographical constraints addressed above, and are difficult to predict. The lack of DEB-FKV performance data or an appropriate manning standard for that type of equipment further complicates the prediction task. Based on past manning practices, and ignoring geographical constraints, it is recommended that 0.75 man authorization be added to the nodal maintenance workcenter for each unmanned site support. Minimum dispatch workcenter manning is two technicians (as per AFCSR26-3, Manpower Standards, 15 May 1975). It should be noted that geographical separation, travel time, and mission response may require increasing the recommended man authorization to as high as 1.35 man authorization per unmanned site.

6.3.1.3 Five-Level Technician Requirements

"Five-level" skill technician manning throughout the technical control and radio maintenance career field is approximately 52 percent (average) the total manning authorization for the given Air Force specialty code (AFSC). It is recommended that this mix be continued and applied to the total manning requirements derived in 6.3.1.2 above.

6.3.2 DATEC Output Display Considerations

This second group of items addresses three questions regarding DATEC's output displays:

- How might a particular display provide indications of escalating troubles?
- How may DATEC displays be adjusted or modified so that they can be restructured in a manner to suit the needs of a maintenance technician, a technical controller, or a squadron level management control function?
- How may DATEC be adjusted to total link outages such that a cascade of alarms will not occur?

6.3.2.1 Escalating Troubles

The System Overview display provides all the information that is required to detect and trace a developing problem. Any abnormal condition of the equipments in operation on a link will be reported on this display. Only discrepant status is displayed. If there are no problems, there are no entries in any of the fields. A parameter which is out of tolerance is indicated by an "A" (amber) flag symbol in the field of the discrepant equipment. A hard alarm, indicating that a particular piece of equipment has failed preset limits within the device itself, is indicated by a "R" (red) flag symbol. An escalating problem, then, might start out as a degrading parameter which would first receive an "A" notation. When the problem developed to the point that equipment operation was severely impaired and an alarm was generated by that equipment, the status flag would change to "R". A few examples of this were obtained during field tests. There were not too many because generally, when the amber condition was noted on the System Overview display, the technical controllers went immediately to a lower display such as Link Status or Link Performance Assessment in attempting to isolate the cause. One good illustration, however, of an escalating trouble was noted in the Appendix U scenario conducted on 20 June 1977 (refer to pages 291 through 300). In this scenario, frame errors are caused in both the T1WB1 and T1-4000 by blanking the received baseband from the radio using a special piece of test equipment. The length of the blanking pulse and therefore the severity of the problem could be varied. As will be noted, from the two System Overview displays printed out at 0843 and 0846, the problem is severe enough to cause a parameter (FER) alarm by exceeding preset limits in DATEC software. The next two displays printed out at 0847 and 0852 indicate that the problem has now progressed to the point that an equipment alarm (T1-4000 Switch Major) has occurred and the amber flag on System Overview has changed to red.

6.3.2.2 Modification of DATEC Displays to Meet Functional Needs

Figures 6-20 and 6-21 illustrate recommended System Overview and Link Status displays that satisfy technical controller's needs. These were described in the trip report on testing the Digital Automated Technical Control at Fort Huachuca dated 9 August 1977 written by 1st Lt. Chris M. Sandifer and T. Sgt. Robert R. Reinke. These displays could be implemented quite easily with the Digital ATEC software principally due to its modular design. Figure 6-22 shows the data structure of the output display software. The software is driven by two disk files, the display generator file and the display fields file. The display generator file contains all information required by the software to generate the fields for a particular display. The display fields file contains the fixed and variable fields that actually make up the display. When a display is generated, the applicable processing software reads the records from the display generator file to determine where to find data in the data base for generating the display fields. Once they are generated, they are written into the variable fields of the display fields file. This file is then read and transferred to the ADDS CRT by the software. In order to restructure a display, it involves only restructuring the order of data in the two disk files. If new fields are desired, it involves entering new data in the files and writing new software for generating the new field.

With similar information from maintenance or squadron level management personnel, displays satisfying their requirements could be implemented in a similar manner.

6.3.2.3 Display Adjustment to Prevent Alarm Cascading

Currently, DATEC software reports all alarms received from a MAD and blinks the highest major alarm received. If a total link outage occurs, what will be seen on the overview display will be a blinking Rx problem for the radio and red alarms for the MUX switch, the T1-4000, the T1WB1 and the CY-104. It is a trivial problem to modify the overview display processing modules to refrain from processing the lower level equipment fields if a Radio Rx major alarm occurs. This modification requires less than 10 words of code.

SCAN NO.			SYSTEM OVERVIEW		TIME
LINK NO.	RADIO	HIGH LEVEL MUX	LOW LEVEL MUX	SITE	TELEM-ETRY
Mxxxx					
Mxxxx					
Mxxxx					
Dxxxx					
Txxxx					
Sxxxx					

FIGURE 6-20. RECOMMENDED OVERVIEW DISPLAY

SCAN NO. Mxxxx LINK STATUS TIME

RADIO	SITE #1	SITE #2	T1-4000	SITE #1	SITE #2
Tx A			Tx PROB		
Rx A			Rx PROB		
Tx B			Sw MAJOR		
Rx B			Sw MINOR		
			MAJOR		
Rx SQUELCH			Tx IN SVC		
			Rx IN SVC		
RSL MARGIN A			MAINT		
RSL MARGIN B					
			XMIT FER A		
Tx EYE MARGIN A			RCV FER A		
Rx EYE MARGIN A			CRFRM A		
Tx EYE MARGIN B			XMIT FER B		
Rx EYE MARGIN B			RCV FER B		
			CRFRM B		

FIGURE 6-21. RECOMMENDED LINK STATUS DISPLAY

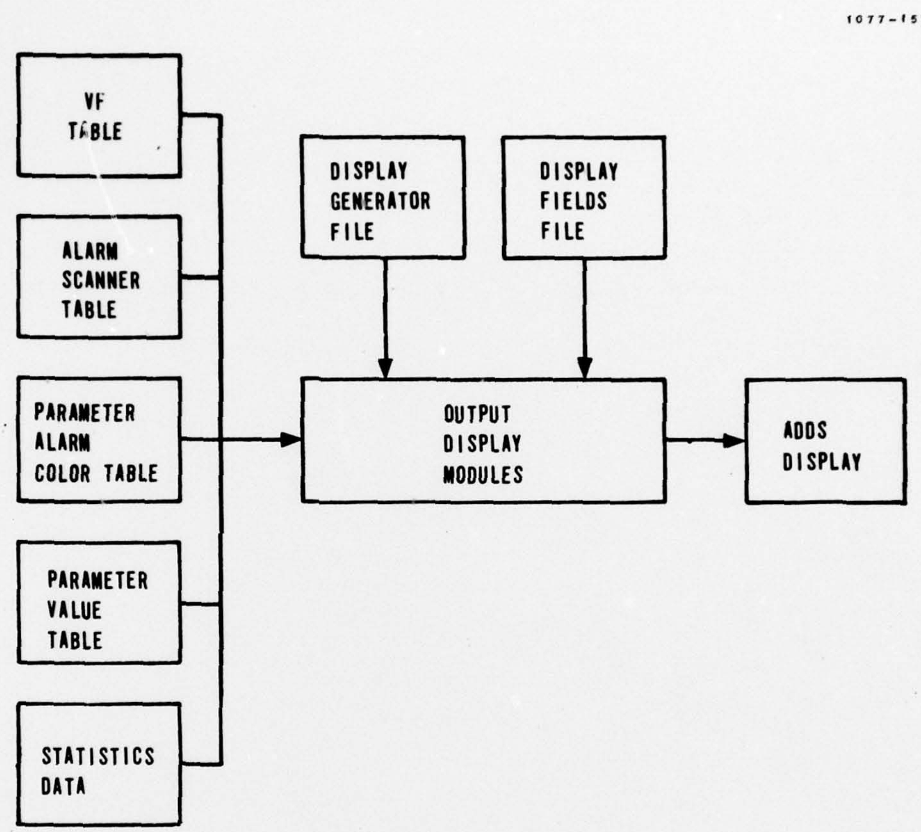

FIGURE 6-22. OUTPUT DISPLAY SOFTWARE/DATA STRUCTURE